



**University of
Zurich^{UZH}**

**Zurich Open Repository and
Archive**

University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2018

The role of environmental factors in allergy: A critical reappraisal

Gilles, Stefanie ; Akdis, Cezmi ; Lauener, Roger ; Schmid-Grendelmeier, Peter ; Bieber, Thomas ;
Schäppi, Georg ; Traidl-Hoffmann, Claudia

Abstract: Allergies are usually referred to as type I hypersensitivity reactions against innocuous environmental antigens, characterized by a Th2/IgE-dominated inflammation. They can manifest themselves in various organs, such as skin, gastrointestinal and respiratory tract, and comprise diseases as diverse as allergic rhinitis and conjunctivitis, bronchial asthma, oral allergy syndrome, food allergy, urticaria and atopic eczema, but also anaphylactic shock. Within the last decades, there was a significant global increase in allergy prevalence, which has been mostly attributed to changes in environment and lifestyle. But which, among all factors discussed, are the most relevant, and what are the mechanisms by which these factors promote or prevent the development of allergic diseases? To answer this, it is necessary to go back to the two key questions that have occupied allergy researchers for the last decades: Firstly, what makes an allergen an allergen? Secondly, why are more and more individuals affected? Within the last decade, we have made considerable progress in answering these questions. This review gives an overview over scientific progress in the field, summarizes latest findings and points out future prospective and research needs.

DOI: <https://doi.org/10.1111/exd.13769>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-160469>

Journal Article

Accepted Version

Originally published at:

Gilles, Stefanie; Akdis, Cezmi; Lauener, Roger; Schmid-Grendelmeier, Peter; Bieber, Thomas; Schäppi, Georg; Traidl-Hoffmann, Claudia (2018). The role of environmental factors in allergy: A critical reappraisal. *Experimental Dermatology*, 27(11):1193-1200.

DOI: <https://doi.org/10.1111/exd.13769>

Allergic Rhinitis and its Impact on Asthma (ARIA) Phase 4 (2018): Change management in allergic rhinitis and asthma multimorbidity using mobile technology

Jean Bousquet, MD,^{a,b,c} Peter W. Hellings, MD,^d Ioana Agache, MD,^e Flore Amat, MD,^{rr} Isabella Annesi-Maesano, MD,^f
Ignacio J. Ansotegui, MD,^g Josep M. Anto, PhD,^{h,i,j,k} Claus Bachert, MD,^l Eric D. Bateman, MD,^m Anna Bedbrook, BSc,^b
Kazi Bennoor, MD,ⁿ Mickael Bewick, MD,^o Carsten Bindslev-Jensen, MD,^p Sinthia Bosnic-Anticevich, PhD,^q
Isabelle Bosse, MD,^r Jan Brozek, MD,^s Luisa Brussino, MD,^t Giorgio W. Canonica, MD,^u Victoria Cardona, MD,^v
Thomas Casale, MD,^w Alfonso M. Cepeda Sarabia, MD,^x Niels H. Chavannes, MD,^y Lorenzo Cecchi, MD,^z
Jaime Correia de Sousa, MD,^{aa} Elisio Costa, PhD,^{bb} Alvaro A. Cruz, MD,^{cc} Wienczyslawa Czarlewski, MD,^{dd}
Giuseppe De Carlo, MD,^{ee} Giulia De Feo, MD,^{ff} Pascal Demoly, MD,^{f,gg} Philippe Devillier, MD,^{hh} Mark S. Dykewicz, MD,ⁱⁱ
Yehia El-Gamal, MD,^{jj} Esben E. Eller, MD,^p Joao A. Fonseca, MD,^{kk} Jean-Francois Fontaine, MD,^{ll}
Wytske J. Fokkens, MD,^{mmm} Maria-Antonieta Guzman, MD,ⁿⁿ Tari Haahtela, MD,^{oo} Maddalena Illario, MD,^{pp}
Juan-Carlos Ivancevich, MD,^{qq} Jocelyne Just, MD,^{rr} Igor Kaidashev, MD,^{ss} Musa Khaitov, PhD,^{tt} Omer Kalayci, MD,^{uu}
Thomas Keil, MD,^{vv} Ludger Klimek, MD,^{ww} Marek L. Kowalski, MD,^{xx} Piotr Kuna, MD,^{yy} Violeta Kvedariene, MD,^{zz}
Desiree Larenas-Linnemann, MD,^{aaa} Daniel Laune, PhD,^{bbb} Lan T. T. Le, MD,^{ccc} Karin Lodrup Carlsen, MD,^{ddd}
Olga Lourenc,o, PhD,^{eee} Bassam Mahboub, MD,^{fff} Alpna Mair, PhD,^{ggg} Enrica Menditto, PhD,^{hhh}
Branislava Milenkovic, MD,ⁱⁱⁱ Mario Morais-Almeida, MD,^{jjj} Ralph Mosges, MD,[€] ^{kkk} Joaquim Mullol, MD,^{lll}
Ruth Murray, PhD,^{mmm} Robert Naclerio, MD,ⁿⁿⁿ Leyla Namazova-Baranova, MD,^{ooo} Ettore Novellino, PhD,^{ppp}
Robyn E. O'Hehir, MD,^{qqq} Ken Ohta, MD,^{rrr} Yoshitaka Okamoto, MD,^{sss} Kimi Okubo, MD,^{ttt}
Gabrielle L. Onorato, MSc,^b Susanna Palkonen, MD,^{ee} Petr Panzner, MD,^{uuu} Nikos G. Papadopoulos, MD,^{vvv}
Hae-Sim Park, MD,^{www} Ema Paulino, PhD,^{xxx} Ruby Pawankar, MD,^{yyy} Oliver Pfaar, MD,^{zzz,aaaa}
Davor Plavec, MD,^{bbbb} Ted A. Popov, MD,^{cccc} Paul Potter, MD,^{dddd} Emmanuel P. Prokopakis, MD,^{eeee}
Menachem Rottem, MD,^{ffff} Dermot Ryan, MD,^{gggg} Johanna Salimaki, MSc,[€] ^{hhhh} Boleslaw Samolinski, MD,ⁱⁱⁱ
Mario Sanchez-Borges, MD,^{jjjj} Holger J. Schunemann, MD,^s Aziz Sheikh, MD,^{kkkk} Juan-Carlos Sisul, MD,^{lll}
Rojin Rajabian-Soderlund, PhD,[€] ^{mmmm} Talant Sooronbaev, MD,ⁿⁿⁿⁿ Cristiana Stellato, MD,^{ff} Teresa To, PhD,^{oooo}
Ana-Maria Todo-Bom, MD,^{pppp} Peter-Valentin Tomazic, MD,^{qqqq} Sanna Toppila-Salmi, MD,^{oo} Antonio Valero, MD,^{rrrr}
Arunas Valiulis, MD,^{ssss} Erkka Valovirta, MD,^{tttt} Maria-Teresa Ventura, MD,^{uuuu} Martin Wagenmann, MD,^{vvvv}
De Yun Wang, MD,^{wwww} Dana Wallace, MD,^{xxxx} Susan Wasserman, MD,^{yyyy} Magnus Wickman, MD,^{zzzz}
Arzu Yorgancioglu, MD,^{aaaaa} Luo Zhang, MD,^{bbbbb} Nanshan Zhong, MD,^{ccccc} Mihaela Zidarn, MD,^{dddd} and
Torsten Zuberbier, MD,^{eeee} for the Mobile Airways Sentinel Network (MASK) Study Group*

Montpellier, Montigny-le-Bretonneux, Paris, La Rochelle, Levallois, and Reims, France; Brussels, Leuven, and Ghent, Belgium; Brasov, Romania; Erandio and Barcelona, Spain; Cape Town, South Africa; Dhaka, Bangladesh; London, Edinburgh, and Manchester, United Kingdom; Odense, Denmark; Glebe, Australia; Hamilton and Toronto, Ontario, Canada; Torino, Milan, Prato, Salerno, Naples, and Bari, Italy; Tampa and Fort Lauderdale, Fla; Barranquilla, Colombia; Leiden and Amsterdam, The Netherlands; Braga/Guimaraes, Porto,~ Covilha, Lisbon, and Coimbra, Portugal; Salvador, Brazil; St Louis, Mo; Cairo, Egypt; Santiago, Chile; Helsinki, Finland; Buenos Aires,~ Argentina; Poltava, Ukraine; Moscow, Russian Federation; Ankara and Manisa, Turkey; Wuerzburg, Wiesbaden, Cologne, Hamburg,

Mannheim, Dusseldorf, and Berlin, Germany; Lodz, Poland; Vilnius, Lithuania; Mexico City, Mexico; Hochiminh City, Vietnam; Oslo, Norway; Dubai, United Arab Emirates; Belgrade, Serbia; Dundalk, Ireland; Baltimore, Md; Melbourne, Australia; Tokyo and Chiba, Japan; Prague, Czech Republic; Athens and Heraklion, Greece; Suwon, South Korea; Osijek, Croatia; Sofia, Bulgaria; Afula, Israel; Helsinki and Turku, Finland; Warsaw, Poland; Caracas, Venezuela; Asuncion, Paraguay; Stockholm and Eskilstuna, Sweden; Bishkek, Kyrgyzstan; Graz, Austria; Singapore; Beijing and Guangzhou, China; and Golnik, Slovenia

Allergic Rhinitis and its Impact on Asthma (ARIA) has evolved from a guideline by using the best approach to integrated care pathways using mobile technology in patients with allergic rhinitis (AR) and asthma multimorbidity. The proposed next phase of ARIA is change management, with the aim of providing an active and healthy life to patients with rhinitis and to those with asthma multimorbidity across the lifecycle

irrespective of their sex or socioeconomic status to reduce health and social inequities incurred by the disease. ARIA has followed the 8-step model of Kotter to assess and implement the effect of rhinitis on asthma multimorbidity and to propose multimorbid guidelines. A second change management strategy is proposed by ARIA Phase 4 to increase self-medication and shared decision making in rhinitis and asthma multimorbidity. An

From ^aUniversity Hospital, Montpellier; ^bMACVIA-France, Fondation partenariale FMC VIA-LR, Montpellier; ^cVIMA, INSERM U 1168, VIMA: Ageing and Chronic Diseases Epidemiological and Public Health Approaches, Villejuif, Université Versailles St-Quentin-en-Yvelines, UMR-S 1168, Montigny-le-Bretonneux, and Euforea, Brussels; ^dthe Laboratory of Clinical Immunology, Department of Microbiology and Immunology, KU Leuven; ^eTransylvania University Brasov, Brasov; ^fEpidemiology of Allergic and Respiratory Diseases Department, Institute Pierre Louis of Epidemiology and Public Health, INSERM, and UPMC Sorbonne Université, Medical School Saint Antoine, Paris; ^gthe Department of Allergy and Immunology, Hospital Quiron Bizkaia, Erandio; ^hISGlobal, Centre for Research in Environmental Epidemiology (CREAL), Barcelona; ⁱIMIM (Hospital del Mar Research Institute), Barcelona;

^jCIBER Epidemiologia y Salud Publica (CIBERESP), Barcelona; ^kUniversitat Pompeu Fabra (UPF), Barcelona; ^lthe Upper Airways Research Laboratory, ENT Department, Ghent University Hospital; ^mthe Department of Medicine, University of Cape Town; ⁿthe Department of Respiratory Medicine, National Institute of Diseases of the Chest and Hospital, Dhaka; ^oIQ4U Consultants, London; ^pthe Department of Dermatology and Allergy Centre, Odense University Hospital, Odense Research Center for Anaphylaxis (ORCA), Odense; ^qWoolcock Institute of Medical Research, University of Sydney and Woolcock Emphysema Centre and Local Health District, Glebe;

^rAllergist in private practice, La Rochelle; ^sDepartment of Health Research Methods, Evidence, and Impact, Division of Immunology and Allergy, Department of Medicine, McMaster University, Hamilton; ^tthe Department of Medical Sciences, Allergy and Clinical Immunology Unit, University of Torino & Mauriziano Hospital, Torino; ^uPersonalized Medicine Clinic Asthma & Allergy, Humanitas University, Humanitas Research Hospital, Rozzano, Milan; ^vthe Allergy Section, Department of Internal Medicine, Hospital Vall d'Hebron, Barcelona, and ARADyAL Spanish Research Network, Barcelona; ^wthe Division of Allergy/Immunology, University of South Florida, Tampa; ^xthe Allergy and Immunology Laboratory, Metropolitan University, Simon Bolivar University, Barranquilla, and SLaa, Sociedad Latinoamericana de Alergia, Asma e Immunologia, Barranquilla; ^ythe Department of Public Health and Primary Care, Leiden University Medical Center; ^zSOS Allergy and Clinical Immunology, USLToscana Centro, Prato; ^{aa}Life and Health Sciences Research Institute (ICVS), School of Medicine, University of Minho, Braga, and ICVS/3B's, PT Government Associate Laboratory, Braga/Guimarães; ^{ab}UCIBIO, REQUINTE, Faculty of Pharmacy and Competence Center on Active and Healthy Ageing of University of Porto (Porto4Ageing), Porto; ^{ac}ProAR-Núcleo de Excelência em Asma, Federal University of Bahia, Brasil and WHO GARD Planning Group, Salvador; ^{ad}Medical Consulting Czarlewski, Levallois; ^{ae}European Federation of Allergy and Airways Diseases Patients' Associations, Brussels; ^{af}the Department of Medicine, Surgery and Dentistry "Scuola Medica Salernitana," University of Salerno; ^{ag}the

Department of Respiratory Diseases, Montpellier University Hospital; ^{ah}Laboratoire de Pharmacologie Respiratoire UPRES EA220, Hôpital Foch, Suresnes, Université Versailles Saint-Quentin, Université Paris-Saclay, Paris; ^{ai}the Section of Allergy and Immunology, Saint Louis University School of Medicine, St Louis; ^{aj}the Pediatric Allergy and Immunology Unit, Children's hospital, Ain Shams University, Cairo; ^{ak}CINTESIS, Center for research in health technologies and information systems, Faculdade de Medicina da Universidade do Porto, and MEDIDA, Lda, Porto. ^{al}Allergist in private practice, Reims; ^{am}the Department of Otorhinolaryngology, Academic Medical Centres, AMC, Amsterdam; ^{an}the Immunology and Allergy Division, Clinical Hospital, University of Chile, Santiago; ^{ao}the Skin and Allergy Hospital, Helsinki University Hospital and University of Helsinki; ^{ap}the Division for Health Innovation, Campania Region and Federico II University and Hospital Naples (DISMET and R1D Unit) Naples;

^{aq}Servicio de Alergia e Immunologia, Clinica Santa Isabel, Buenos Aires; the Allergy Department, Centre de l'Asthme et des Allergies Hôpital d'Enfants Armand-Trousseau (APHP), and Sorbonne Université, UPMC Univ Paris 06, UMR_S 1136, Institut Pierre Louis d'Epidemiologie et de Sante Publique, Equipe EPAR, Paris;

^{as}Ukrainian Medical Stomatological Academy, Poltava; ^{at}the National Research Center, Institute of Immunology, Federal Medicobiological Agency, Laboratory of Molecular immunology, Moscow; ^{au}the Pediatric Allergy and Asthma Unit, Hacettepe University School of Medicine, Ankara; ^{av}the Institute of Social Medicine, Epidemiology and Health Economics, Charité-Universitätsmedizin Berlin, and the Institute for Clinical Epidemiology and Biometry, University of Würzburg; ^{aw}the Center for Rhinology and Allergy, Wiesbaden; ^{ax}the Department of Immunology and Allergy, Healthy Ageing Research Center, Medical University of Lodz; ^{ay}the Division of Internal Medicine, Asthma and Allergy, Barlicki University Hospital, Medical University of Lodz; ^{az}the Faculty of Medicine, Vilnius University; ^{ba}the Center of Excellence in Asthma and Allergy, Medica Sur Clinical Foundation and Hospital, Mexico City;

^{bbb}Kyomed, Montpellier; ^{ccc}the University of Medicine and Pharmacy, Hochiminh City; ^{ddd}Oslo University Hospital, Department of Paediatrics, Oslo, and the University of Oslo, Faculty of Medicine, Institute of Clinical Medicine, Oslo; ^{eee}Faculty of Health Sciences and CICS-UBI, Health Sciences Research Centre, University of Beira Interior, Covilhã; ^{fff}the Department of Pulmonary Medicine, Rashid Hospital, Dubai;

^{ggg}DG for Health & Social Care, Scottish Government, Edinburgh; ^{hhh}CIRFF, Federico II University, Naples; ⁱⁱⁱthe Clinic for Pulmonary Diseases, Clinical Center of Serbia, Faculty of Medicine, University of Belgrade, Serbian Association for Asthma and COPD, Belgrade; ^{jjj}the Allergy Center, CUF Descobertas Hospital, Lisbon; ^{kkk}the Institute of Medical Statistics, and Computational Biology, Medical Faculty, University of Cologne, and CRI-Clinical Research International, Hamburg; ^{lll}the Rhinology Unit & Smell Clinic, ENT Department, Hospital Clinic; ^{mmm}Clinical & Experimental

Respiratory Immunology, IDIBAPS, CIBERES, University of Barcelona; ⁿⁿⁿⁿMedScript, Dundalk; ⁿⁿⁿⁿJohns Hopkins School of Medicine, Baltimore; ^{ooo}the Scientific Centre of Children's Health under the MoH, Moscow; ^{ppp}Department of Pharmacy of University of Naples Federico II, Naples; ^{qqq}OHEHIR, Department of Allergy, Immunology and Respiratory Medicine, Alfred Hospital and Central Clinical School, Monash University, Melbourne, and the Department of Immunology, Monash University, Melbourne; ^{rrr}the National Hospital Organization, Tokyo National Hospital, Tokyo; ^{sss}the Department of Otorhinolaryngology, Chiba University Hospital; ^{ttt}the Department of Otolaryngology, Nippon Medical School, Tokyo; ^{uuu}the Department of Immunology and Allergology, Faculty of Medicine in Pilsen, Charles University Prague; ^{vvv}the Center for Pediatrics and Child Health, Institute of Human Development, Royal Manchester Children's Hospital, University of Manchester, Manchester, and the Allergy Department, 2nd Pediatric Clinic, Athens General Children's Hospital "P&A Kyriakou," University of Athens; ^{www}the Department of Allergy and Clinical Immunology, Ajou University School of Medicine, Suwon; ^{xxx}Farmacias Holon, Lisbon; ^{yyy}the Department of Pediatrics, Nippon Medical School, Tokyo; ^{zzz}the Center for Rhinology and Allergology, Wiesbaden; ^{aaaa}the Department of Otorhinolaryngology, Head and Neck Surgery, Universitätsmedizin Mannheim, Medical Faculty Mannheim, Heidelberg University, Mannheim; ^{bbbb}Children's Hospital Srebrnjak, Zagreb, School of Medicine, University J.J. Strossmayer, Osijek; ^{cccc}University Hospital "Sv Ivan Rilski," Sofia; ^{dddd}the Allergy Diagnostic and Clinical Research Unit, University of Cape Town Lung Institute; ^{eeee}the Department of Otorhinolaryngology University of Crete School of Medicine, Iraklion; ^{fff}the Division of Allergy Asthma and Clinical Immunology, Emek Medical Center, Afula; ^{gggg}Allergy and Respiratory Research Group, University of Edinburgh; ^{hhhh}the Association of Finnish Pharmacies, Helsinki; ⁱⁱⁱⁱthe Department of Prevention of Environmental Hazards and Allergology, Medical University of Warsaw; ^{jjjj}the Allergy J ALLERGY CLIN IMMUNOL VOLUME nnn, NUMBER nn

innovation of ARIA has been the development and validation of information technology evidence-based tools (Mobile Airways Sentinel Network [MASK]) that can inform patient decisions on the basis of a self-care plan proposed by the health care professional. (J Allergy Clin Immunol 2018;nnn:nnn-nnn.)

Key words: Change management, rhinitis, asthma, Allergic Rhinitis and Its Impact on Asthma

Allergic Rhinitis and its Impact on Asthma (ARIA) has evolved from a guideline using the best approach¹⁻⁵ to integrated care pathways (ICPs) using mobile technology in patients with AR and asthma multimorbidity.⁶ The term comorbidity is commonly used for allergic diseases, but multimorbidity might be more appropriate. Comorbidity is the presence of 1 or more additional

and Clinical Immunology Department, Centro Medico-Docente la, Trinidad and Clinica El Avila, Caracas; ^{kkkk}Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh; ^{llll}Sociedad Paraguaya de Alergia Asma e Inmunología, Asuncion; ^{mmmm}the Department of Nephrology and Endocrinology, Karolinska University Hospital, Stockholm; ⁿⁿⁿⁿ

Kyrgyzstan National Centre of Cardiology and Internal medicine, Euro-Asian respiratory Society, Bishkek; ^{oooo}Siddkids hospitala and Institute of Health Policy, Management and Evaluation, Toronto; ^{pppp}Imunoalergologia, Centro Hospitalar Universitario de Coimbra and Faculty of Medicine, University of Coimbra; ^{qqqq}the Department of ENT, Medical University of Graz; ^{rrrr}the Pneumology and Allergy Department CIBERES and Clinical & Experimental Respiratory Immunology, IDIBAPS, University of Barcelona; ^{ssss}Vilnius University Institute of Clinical Medicine, Clinic of Children's Diseases, and Institute of Health Sciences, Department of Public Health, Vilnius, Lithuania, and the European Academy of Paediatrics (EAP/UEMSSP), Brussels; ^{tttt}the Department of Lung Diseases and Clinical Immunology Allergology, University of Turku and Terveystalo Allergy Clinic, Turku; ^{uuuu}University of Bari Medical School, Unit of Geriatric Immunology, Bari; ^{vvvv}Department of Otorhinolaryngology, Universitätsklinikum Düsseldorf; ^{wwww}the Department of Otolaryngology, Yong Loo Lin School of Medicine, National University of Singapore; ^{xxxx} ^{yyyy} Nova Southeastern University, Fort Lauderdale; the Department of Medicine, Clinical Immunology and Allergy, McMaster University, Hamilton; ^{zzzz}the Centre for Clinical Research Sörmland, Uppsala University, Eskilstuna; ^{aaaaa}the Department of Pulmonology, Celal Bayar University, Manisa; ^{bbbbb}the Department of

BOUSQUET ET AL 3

Boehringer, and AstraZeneca outside the submitted work. S. Bosnic-Anticevich reports personal fees from Teva, Boehringer Ingelheim, Sanofi, AstraZeneca, and GlaxoSmithKline and grants from Teva and Meda outside the submitted work. J. Bousquet reports personal fees and other support from Chiesi, Cipla, Hikma, Menarini, Mundipharma, Mylan, Novartis, Sanofi-Aventis, Takeda, Teva, and Uriach outside the submitted work and support from Kyomed. W. Carr reports other from Regeneron/ Sanofi, AstraZeneca, Teva, Glenmark Pharmaceuticals, Boehringer Ingelheim, and Optinose outside the submitted work. J. Correia de Sousa reports other support from BoehringerIngelheimand Novartis and grants from AstraZenecaoutside the submitted work. A. A. Cruz reports grants and personal fees from GlaxoSmithKline; personal fees from Boehringer Ingelheim, AstraZeneca, Novartis, Chiesi, Eurofarma, and Mylan; and personal fees from Merck, Sharp & Dohme, and Sanofi-Aventis outside the submitted work. J. C. Ivancevich reports personal fees from Faes Farma and Sanofi and other support from Lab Casasco outside the submitted work. J. Just reports grants and personal fees from Novartis, personal fees from AstraZeneca, grants and personal fees from ALK-Abello, and personal fees from Thermo Fisher outside the submitted work. P. Kuna reports personal fees from Adamed, Boehringer Ingelheim, and AstraZeneca and personal fees from Chiesi, FAES, Berlin Chemie, Novartis, Polpharma, and Allergopharma outside the submitted work. V. Kvedariene has received payment for consultancy from GlaxoSmithKline and payment for lectures from Stallergenes Greer and Berlin-Chemie outside the submitted work. D. Larenas-Linnemann reports personal fees from GlaxoSmithKline, AstraZeneca, MEDA, Boehringer Ingelheim, Novartis, Grunenthal, UCB, Amstrong, Siegfried, DBV Technologies, MSD, and Pfizer and grants from Sanofi, AstraZeneca, Novartis, UCB, GlaxoSmithKline, Teva, Chiesi, and Boehringer Ingelheim outside the submitted work. R. Møsges reports personal fees from ALK-Abello, Allergopharma, Allergy Therapeutics, Friulchem, Hexal, Servier, Klosterfrau, Bayer, FAES, GlaxoSmithKline, MSD, Johnson & Johnson, MEDA, Stada, UCB, and Nuvo; grants from ASIT Biotech, Leti, Optima, BitopAG, Hulka, and Ursapharm; grants and personal fees from Bencard and Stallergenes; personal fees and nonfinancial support from Lofarma and Novartis; and nonfinancial support from Atmos, Roxall, Bionorica, Otonomy, and Ferrero outside the submitted work. R. Naclerio reports fees from the advisory boards of Sanofi and Novartis. Y. Okamoto reports personal fees from Shionogi, Torii, GlaxoSmithKline, MSD, Kyowa, and Eisai; grants and personal fees from Kyorin and Tiho; and grants from Yakuruto and Yamada Bee Farm outside the submitted work. N. G. Papadopoulos reports personal fees from Abbvie Novartis, Faes Farma, Biomay, HAL, Nutricia Research, Menarini, Novartis, MEDA, MSD, Omega Pharma, and Danone and

Abbreviations used

Otolaryngology–Head and Neck Surgery, Beijing TongRen Hospital and Beijing Institute of Otolaryngology, Beijing; ^{cccc}the State Key Laboratory of Respiratory Diseases, Guangzhou Institute of Respiratory Disease, First Affiliated Hospital of Guangzhou Medical University, Guangzhou; ^{dddd}the University Clinic of Respiratory and Allergic Diseases, Golnik; and ^{eeee}Comprehensive Allergy Center Charite, Department of Dermatology and Allergy, Charite-Universitätsmedizin Berlin, and Global Allergy and Asthma European Network (GA²LEN), Berlin.

*For a listing of members of the Mobile Airways Sentinel Network (MASK) Study Group, see the acknowledgments section at the end of the article. Supported by the European Innovation Partnership on Active and Healthy Ageing and POLLAR (EIT Health, European Union).

Disclosure of potential conflict of interest: F. Amat reports grants and personal fees from Novartis and nonfinancial support from Zambon and Stallergenes Greer outside the submitted work. C. Bachert reports personal fees from Uriach and Mylan outside the submitted work. F. de Blay reports grants from Stallergenes Greer; personal fees from Novartis, ALK-Abello, Mundipharma, AstraZeneca, Boehringer and Teva; and other support from Stallergenes Greer, Novartis, ALK-Abello, Medapharma, Teva,

AIRWAYS ICP: Integrated care pathway for airway diseases
 AR: Allergic rhinitis
 ARIA: Allergic Rhinitis and its Impact on Asthma CM: Change management
 CM2: Second phase of change management
 DG Sante: Directorate General for Health and Food Safety
 GINA: Global Initiative for Asthma
 GRADE: Grading of Recommendation, Assessment, Development and Evaluation
 ICP: Integrated care pathway
 IT: Information technology
 MASK: Mobile Airways Sentinel Network
 POLLAR: Impact of Air Pollution on Asthma and Rhinitis
 SDM: Shared decision making

grants from Menarini outside the submitted work. J. L. Pepin reports grants from the Air Liquide Foundation, AGIR a dom, AstraZeneca, Fisher & Paykel, Mutualia, Philips, Resmed, and Vitalaire and other support from AGIR a dom, AstraZeneca, Boehringer Ingelheim, Jazz Pharmaceutical, Night Balance, Philips, Resmed, and Sefam outside the submitted work. O. Pfaar reports grants and personal fees from ALKAbello, Allergopharma, Stallergenes Greer, HAL Allergy Holding BV/HAL Allergie GmbH, Bencard Allergie GmbH/Allergy Therapeutics, Lofarma, ASIT Biotech Tools SA, Laboratorios LETI/LETI Pharma, AnergisSA, grants from Biomay, Nuvo, Circassia, and Glaxo Smith Kline and personal fees from Novartis Pharma, MEDA Pharma, Mobile Chamber Experts (a GA2LEN Partner), Pohl-Boskamp, and Indoor Biotechnologies outside the submitted work. D. Plavec reports grants and personal fees from GlaxoSmithKline; personal fees from Menarini, Pliva, AbbVie, Novartis, MSD, Chiesi, and Revenio; personal fees and nonfinancial support from Boehringer Ingelheim; and nonfinancial support from Philips outside the submitted work. D. Price reports grants and personal fees from Aerocrine, Almirall, Amgen, Cipla, GlaxoSmithKline, Kyorin, Merck, Mylan, and Skyepharma; grants from AKL Research and Development, the Respiratory Effectiveness Group, the British Lung Foundation, and the UK National Health Service; grants and personal fees from AstraZeneca, Boehringer Ingelheim, Chiesi, Mundipharma, Napp, Novartis, Pfizer, Teva, Theravance, and Zentiva; nonfinancial support from the Efficacy and Mechanism Evaluation Programme and Health Technology Assessment outside the submitted work; and stock/stock options from AKL Research and Development Ltd, which produces phytopharmaceuticals; and he owns 74% of the social enterprise Optimum Patient Care (Australia, Singapore, and United Kingdom) and 74% of Observational and Pragmatic Research Institute (Singapore) outside the submitted work. D. Ryan reports personal fees from MEDA and personal fees from Stallergenes outside the submitted work. R. Stelmach reports grants from the São Paulo Research Foundation and MSD; grants and personal fees from Novartis; grants, personal fees, and nonfinancial support from AstraZeneca and Chiesi; and personal fees and nonfinancial support from Boehringer Ingelheim outside the submitted work. A. Todo-Bom reports grants and personal fees from Novartis, Boehringer Ingelheim, Mundipharma, and GlaxoSmithKline; personal fees from Teva Pharma and AstraZeneca; and grants from Leti outside the submitted work. M. Wagenmann reports personal fees from AstraZeneca, Bionorica SE, HAL Allergy, MEDA Pharma, Stallergenes, Teva, and ALK-Abello; grants and personal fees from Allergopharma and Sanofi Aventis; grants from Allakos; and grants from Hoffmann-La Roche, GlaxoSmithKline, Otonomy, and Strekin outside the submitted work. S. Wasserman reports personal fees from Merck, GlaxoSmithKline, Novartis, Behring, Shire, Sanofi, Barid Aralez, Mylan Meda, and Padiapharm outside the submitted work. T. Zuberbier reports organizational affiliations with the WHO Initiative Allergic Rhinitis and Its Impact on Asthma (ARIA; committee member), the German Society for Allergy and Clinical Immunology (DGAKI; board membership), the European Centre for Allergy Research Foundation (ECARF; head), Global Allergy and Asthma European Network (GA2LEN; Secretary General), and the Committee on Allergy Diagnosis and Molecular Allergology, World Allergy Organization (WAO; membership) outside the submitted work. The rest of the authors declare that they have no relevant conflicts of interest.

Received for publication May 18, 2018; revised July 13, 2018; accepted for publication August 13, 2018.

Corresponding author: Jean Bousquet, MD, CHU Arnaud de Villeneuve, 371 Avenue du Doyen Gaston Giraud, 34295 Montpellier Cedex 5, France. E-mail: jean.bousquet@orange.fr.

0091-6749/\$36.00

2018 American Academy of Allergy, Asthma & Immunology

<https://doi.org/10.1016/j.jaci.2018.08.049>

diseases co-occurring with a primary disease or the effect of such additional disorders or diseases. Multimorbidity is a term that means co-occurring diseases in the same patient.^{7,8}

ARIA provides an evidence-based approach for managing the patient's needs, but real-life data have shown that few patients use guidelines and that they often self-medicate (Menditto, in preparation). Moreover, patients largely use over-the-counter medications dispensed in pharmacies.⁹⁻¹¹ Self-care and shared decision making (SDM) centered around the patient should be used more frequently.

Change is inevitable in health care. ARIA has followed a change management (CM) strategy in the past, but a new revised plan should be considered to fill in the gaps of knowledge translation in practice and to increase the benefits of self-care in integrated care pathways (ICPs) by using the currently available information and communication technology tools.¹² These changes should prepare and support individuals, teams, and organizations in making organizational change centered around the patient for more efficient care.

BACKGROUND

The 4 ARIA phases

ARIA was initiated during a World Health Organization workshop in 1999² and has evolved in 4 phases.

Phase 1 included development of an evidence-based document to provide a guide for the diagnosis and management of AR and asthma multimorbidity.^{1,2} In 2008, ARIA was updated using the same recommendation system.^{1,13} ARIA has been disseminated and is implemented in more than 70 countries around the world.¹⁴

For Phase 2, in its 2010 revision, ARIA was the first chronic respiratory disease guideline to adopt the Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach, an advanced evidence evaluation and recommendation methodology for guidelines.^{3,5} When guidelines are made using the same methodology, the recommendations are similar.^{5,15}

In Phase 3 ARIA focused on the implementation of emerging technologies for individualized and predictive medicine to develop ICPs for the management of AR and asthma by a multidisciplinary group centered around the patients (Mobile Airways Sentinel Network [MASK]).¹⁶⁻²³

The proposed ARIA Phase 4 is CM to provide an active and healthy lifestyle to patients with rhinitis and asthma across the lifecycle, irrespective of their sex or socioeconomic status, with the aim of reducing health and social inequities globally.

SDM and patient empowerment

In SDM both the patient and physician contribute to the medical decision-making process, placing the patient at the center of the decision-making paradigm.²⁴ Physicians explain treatments and alternatives to patients, who then choose the treatment option that best aligns with their beliefs, lifestyles, and goals along with the benefits and risks.²⁵ In contrast to SDM, the traditional medical care system places physicians in a position of authority, with patients playing a passive role in care. Patients want greater involvement in SDM.²⁶ An innovation of SDM in ARIA is the use of information technology (IT) evidence-based tools that can

inform patients' decisions based on a guided selfmanagement plan proposed by their health care professionals.²⁷ In asthmatic patients the effectiveness of 4 SDM studies shows improvement of control and some other parameters, but more studies are needed to confirm the data.²⁸

mortality (in asthmatic patients). Although there were articles indicating the links between the upper and lower airways,^{46,47} the effect of rhinitis on asthma was not fully recognized, and ARIA was initiated to better recognize the interrelationships between the 2 diseases and to propose multimorbid guidelines.

CM

Change is inevitable in health care. However, many change projects fail because of varied beliefs and cultural circumstances, poor planning, unmotivated staff, deficient communication, or excessively frequent changes.²⁹

CM aims to prepare and support individuals, teams, and organizations in making organizational change. It proposes methods for redirecting or redefining resources, business processes, budget allocation, and/or modes of operation. When properly applied, CM significantly changes health care and its organization. However, health systems differ largely between countries or even regions, and a combination of CM with ICPs might be more relevant, allowing each organization to use the CM principles according to their needs and regulations. CM deals with different disciplines from health care, behavioral, and social sciences to IT and business solutions.

Although theories might seem abstract and impractical for health care practice, they can help in planning solutions to common health care problems.²⁹ The Lewin 3-step model is widely used^{30,31}: unfreezing, moving, and refreezing.³¹ Lippitt et al³² and Kotter¹² have added intermediate steps (Table I).^{12,29,31-33}

Several models of organizational and personal change have been reviewed for respiratory diseases.³⁴ Kotter's theory has been applied to different fields of medicine³⁵⁻³⁷ and pharmacies.³⁸

ARIA PHASES 1 AND 2 FOLLOWED THE KOTTER 8-STEP CHANGE MODEL

Goals

Guidelines, such as Global Initiative for Asthma (GINA),^{39,40} Global Initiative for Lung Diseases,^{41,42} EPOS (European Position Paper on Rhinosinusitis and nasal polyps),⁴³ and ARIA,^{2,3,13} developed a CM strategy that was very effective and produced many updates and revisions while having a positive effect on clinical care and influencing research priorities.

Most guidelines are condition specific, but ARIA was unique because it included, for the first time, the multimorbid component of airway diseases. Although it followed the patient's perspectives, epidemiologic evidence,⁴⁴ and some supporting mechanistic studies,⁴⁵ this concept was not accepted by the leadership of GINA, who considered neither the asthma-rhinitis multimorbidity concept nor the benefit for the patients.

The 8-step model

Establish a sense of urgency. The sense of urgency should identify and highlight the potential threats and repercussions that might arise in the future by examining the opportunities that can be tapped through effective interventions. In patients with AR and asthma, in the 1990s, the sense of urgency was to provide guidelines that could reduce both the burden of the disease and the

TABLE I. Examples of planned change management models

Lewin ³³	Kotter ¹²	Lippitt et al ³²
Unfreezing	Step 1: Establish a sense of urgency Step 2: Create a guiding coalition Step 3: Develop a vision and strategy	Phase 1: Diagnose the problem Phase 2: Assess motivation and capacity for change Phase 3: Assess change agent's motivation and resources
Moving	Step 4: Communicate the change vision Step 5: Empower others to act on the vision Step 6: Generate short-term wins Step 7: Consolidate gains and produce more change	Phase 4: Select a progressive change objective Phase 5: Choose appropriate role of the change agent
Refreezing	Step 8: Anchor new approaches in the culture and institutionalize the changes	Phase 6: Terminate the helping relationship

Adapted from Antwi et al.³¹

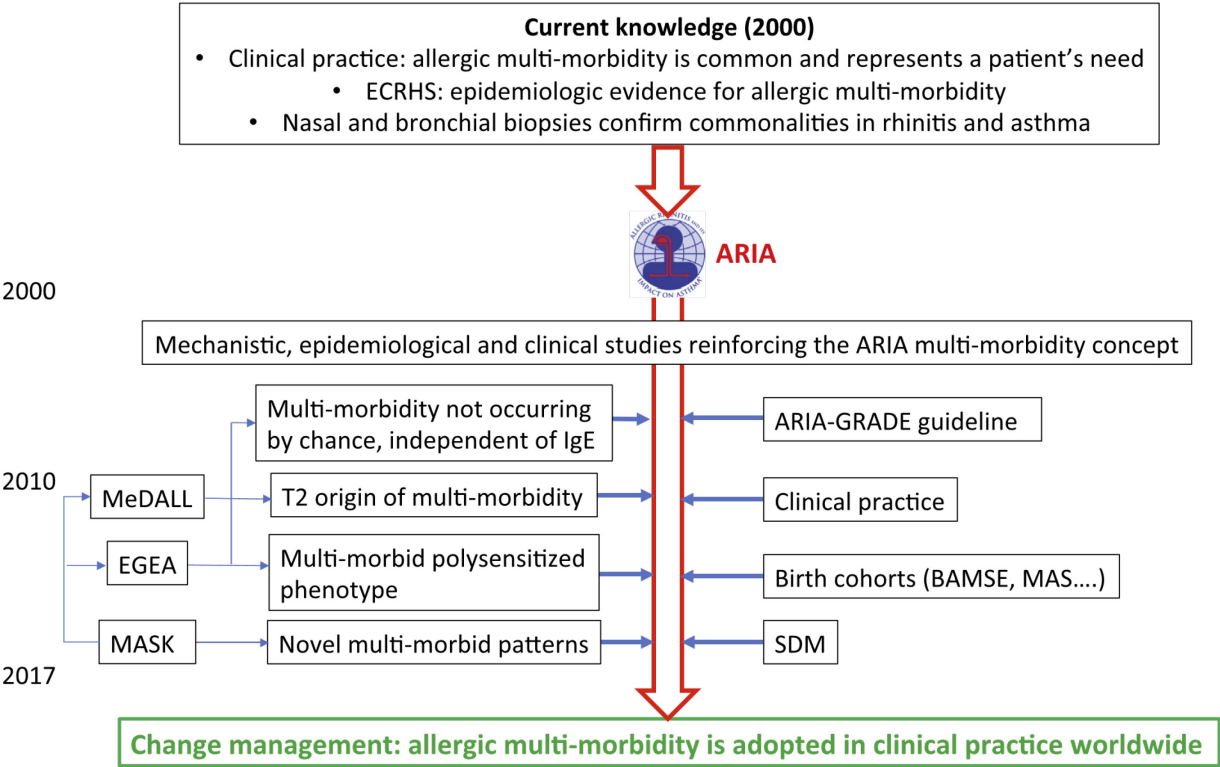


FIG 1. Change management strategy of ARIA Phases 1 and 2. BAMSE, Barn Allergi Milj. Stockholm Epidemiologi Projektet; EGEA, Epidemiological Study on the Genetics and Environment of Asthma, Bronchial Hyperresponsiveness and Atopy; MAS, German Multicenter Allergy Study; MeDALL, Mechanisms of the Development of Allergy; T2, type 2 immunity.

Create a guiding coalition. The ARIA Working Group was initiated during a World Health Organization meeting (December 1999) and evolved as a powerful group with 400 members in 70 countries.¹⁴ Members have been working together for years and include all stakeholders needed for CM.^{1,6} The patient organization European Federation of Allergy and Airways Diseases Patients' Associations has always been an active member of ARIA. Develop a vision and strategy. The ARIA vision has always been to provide a guide for the diagnosis and management of AR and asthma multimorbidity, including

developing countries,^{1,2} by using the best available evidence.^{3,5} ARIA has established 2 major targets: the recognition and implementation of the asthma-rhinitis multimorbidity, as well as a new classification (intermittent-persistent and mild-to-moderate severe AR) to meet patients' expectations. Moreover, ARIA priorities have always included primary care physicians, pharmacists, and patients' organizations.

Communicate the change vision. One of the ARIA strengths has been to communicate its vision effectively worldwide. More than 1000 articles have been posted on PubMed from more than 50 countries by using the ARIA recommendations.¹⁴ The number of training sessions in more than 70 countries cannot be counted. ARIA has been endorsed by many governments and international organizations: ARIA recommendations have been used for the

labeling of allergen immunotherapy by the European Medicines Agency.

Empower others to act on the vision. Organizational processes and structures are in place and are aligned with the overall organizational vision. However, a continuous check is needed for barriers and for people who are resisting change. We have implemented proactive actions to remove the obstacles involved in the process of change.

ARIA has been recognized as the major rhinitis and asthma multimorbidity guideline for years in most countries, except for the United States and Japan. However, the recent US guidelines are using the evidence-based approach of ARIA (GRADE), and the recommendations are similar^{15,48,49} to those of ARIA.⁵ The recent Japanese guidelines for AR are also creating bridges with ARIA.⁵⁰

Generate short-term wins. As proposed by Kotter,¹² creating short-term wins early in the change process instead of having a single long-term goal can produce a feeling of victory in the early stages of change, which will reinforce support for the strategy.

The concept of asthma and rhinitis multimorbidity is now globally accepted in developed and developing countries.⁵¹ It is now recognized that multimorbidity is independent of IgE-mediated allergy,^{8,52} and new phenotypes of severe airway disease have been identified. The implementation of the multimorbid concept in clinical practice has a direct benefit for the patient whose nasal symptoms are often more bothersome than asthma.

Consolidate gains and produce more change. The goals of step 7¹² are to achieve continuous improvement by analyzing the success stories individually and improving from those individual experiences. These goals are exactly those that have been followed by ARIA for the past 18 years.

Anchor new approaches in the culture and institutionalize the changes. The goals of step 8¹² are met by the ARIA strategy:

1. Discuss widely the successful stories related to change initiatives.
2. Ensure that the change becomes an integral part of the practice and is highly visible.
3. Ensure that the support of both existing and new leaders continues to extend toward the change.

Results, drawbacks, and solutions

ARIA has fully achieved its goals following the 8-step Kotter model shown [Fig 1](#). The outcome assessment can be measured in the following ways.

1. By the numbers of citations of ARIA: ARIA 2001 has been cited 1750 times, ARIA 2008 has been cited more than 2300 times (and is the only article on asthma cited >200 times a year), and ARIA 2010 has been cited 710 times. This initiative is far better cited than GINA.
2. By the countries that have endorsed ARIA in their national allergy programs: Finland, Malaysia, the Philippines, Portugal, and Singapore.
3. By the approval of treatments by agencies: The European Medicines Agency used the ARIA classification in the approval of Acarizax (mite sublingual immunotherapy).

Some drawbacks have been pointed out in the Kotter change model.¹² In particular, the model is essentially top-down and might discourage any scope for participation or cocreation. In ARIA we considered that the first CM model was a great success but that its lifecycle had come to an end. It was then decided within the coalition to propose a new CM model based on patients' needs and emerging technologies (second phase of change management [CM2] model).

Because the Kotter model cannot be redesigned, we proposed a new maturity CM model based on the same Kotter 8-step change model.¹² We used ARIA Phase 3 (care pathways for rhinitis and asthma multimorbidity using mobile technology)⁶ to better plan the second CM model (CM2 model) and make new assumptions using a patient-centered approach.

THE ALLERGY DIARY STRENGTHENS CM MASK

In 2012, the European Commission launched the European Innovation Partnership on Active and Healthy Ageing (Directorate General for Health and Food Safety [DG Sante] and Directorate General for Communications Networks, Content & Technology).⁵³ The B3 Action Plan, which was devoted to innovative integrated care models for chronic diseases, selected integrated care pathways for airway diseases (AIRWAYS ICPs)^{54,55} with a lifecycle approach⁵⁶ as the model of chronic diseases. An AIRWAYS ICPs Action Plan was devised,⁵⁴ implemented,⁵⁵ and scaled up.^{57,58} AIRWAYS ICPs is a World Health Organization Global Alliance against Chronic Respiratory Diseases⁵⁹ research demonstration project ([Fig 2](#)).

MASK, ARIA Phase 3, is an AIRWAYS ICPs tool.^{6,60} It represents a good practice focusing on the implementation of multisectoral care pathways using emerging technologies with real-life data in rhinitis and asthma multimorbidity. MASK follows the Joint Action on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle (2nd EU Health Programme 2008-2013)⁶¹ recommendations for good practices.¹⁸

MASK was initiated to reduce the global burden of rhinitis and asthma by giving the patient a simple tool to better prevent and manage respiratory allergic diseases. More specifically, MASK should help to (1) understand the disease mechanisms and effects of air pollution in patients with allergic diseases, (2) better appraise the burden incurred by medical needs but also indirect costs, (3) propose novel multidisciplinary care pathways integrating pollution and patients' literacy, (4) improve work productivity, (5) propose the basis for a sentinel network at the European Union level for pollution and allergy, and (6) assess the societal implications of the project to reduce health and social inequalities globally.

The Allergy Diary

The mobile technology of MASK is the Allergy Diary, an app (Android and iOS) freely available for patients with AR and asthma in 23 countries (16 European Union countries, Argentina, Australia, Brazil, Canada, Mexico, Switzerland, and Turkey) and 16 languages (translated and back-translated, culturally adapted, and legally compliant; [Fig 3](#)).⁶ Anonymized users fill in a simple

questionnaire on asthma and rhinitis on registration and daily assess the effect of the disease by using a visual analog scale⁶² for global allergy symptoms, rhinitis, conjunctivitis, asthma, and work. Moreover, a questionnaire is applied every week to assess disease effect on patients' quality of life (EuroQol).²¹

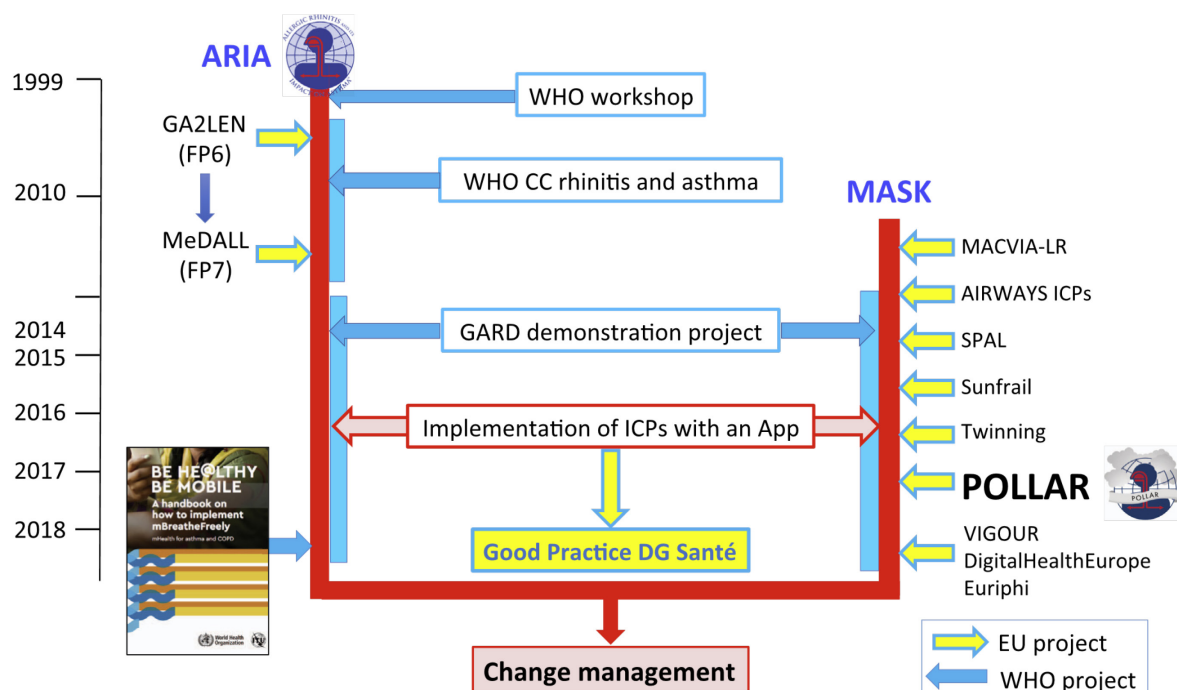


FIG 2. Links between ARIA and MASK for change management. DigitalHealthEurope, Digital Transformation of Health in Europe (H2020); Euriphi, Better Health and Care, Economic Growth and Sustainable Health Systems (H2020); GA²LEN, Global Allergy and Asthma European Network (FP6); GARD, Global Alliance against Chronic Respiratory Diseases; Good Practice DG Sante, Good Practice on digitally enabled, integrated, person-centered care of the Directorate-General for Health and Food Safety (European Commission); MACVIA-LR, Contre les Maladies Chroniques pour un Vieillissement Actif (European Innovation Partnership on Active and Healthy Ageing); MeDALL, Mechanisms of the Development of Allergy (FP7); SPAL, EU Development and Structural Funds; Sunfrail and Twinning, Vigour (Evidence-Based Guidance to Scale-up Integrated Care in Europe, 3rd Health Programme); WHO CC, World Health Organization Collab-

orating Center.

Data of pilot studies in up to 17,000 users and more than 95,000 days are available. The Allergy Diary has been validated¹⁹ and has shown that (1) totally anonymized geolocation can be used in 23 countries (in preparation); (2) data can be analyzed in 23 countries and 17 languages; (3) sleep, work productivity, and daily activities are impaired in patients with AR^{16,17}; (4) daily work productivity is associated with AR severity¹⁶; (5) everyday use of medications can be monitored, proposing a novel assessment of treatment patterns²⁰; (6) novel patterns of multimorbidity have been identified²² and confirmed in epidemiologic studies^{8,63}; and (7) more than 70% of patients with AR self-medicate and are nonadherent to medications (Menditto, in preparation).

The Allergy Diary (Technology Readiness Level 9) represents a validated mobile health tool for the management of AR. Asthma has also been monitored, but data have not yet been analyzed. Economic effects can be monitored by using work productivity. The results of the Allergy Diary have made innovative approaches of AR possible and are directly strengthening CM strategies in ARIA.

Transfer of Innovation of MASK

A Transfer of Innovation (Twinning) project has been funded by the European Innovation Partnership on Active and Healthy Ageing by using MASK in 25 reference sites or regions across Europe, Argentina, Australia, Brazil, Colombia, and Mexico.⁶⁴ The number of countries is increasing, and MASK should be rapidly operative in the United States, China, India (in English only), and Japan. This will improve the understanding, assessment of burden, diagnosis, and management of rhinitis in old age by comparison with an adult population. Twinning has been tested in Germany (Region Kohn-Bonn) in a pilot study that has now been extended to the other German cities and countries of the Twinning project.

Clinical decision support system

Clinical decision support systems are software algorithms that advise health care providers on diagnosis and management based on the interaction of patient data and medical information. They should be based on the best evidence to aid patients and health care professionals to jointly determine treatment (SDM). In patients with AR, the MASK clinical decision support system is incorporated into a tablet interoperable with the Allergy Diary⁶⁵ for health care professionals (ARIA Allergy Diary Companion).^{6,50} This is based on an algorithm to aid clinicians to select pharmacotherapy for patients with AR and to stratify their disease severity.⁶⁶ This approach will be adapted for the patient's guided self-care in the context of SDM.

The Allergy Diary: MASK-air

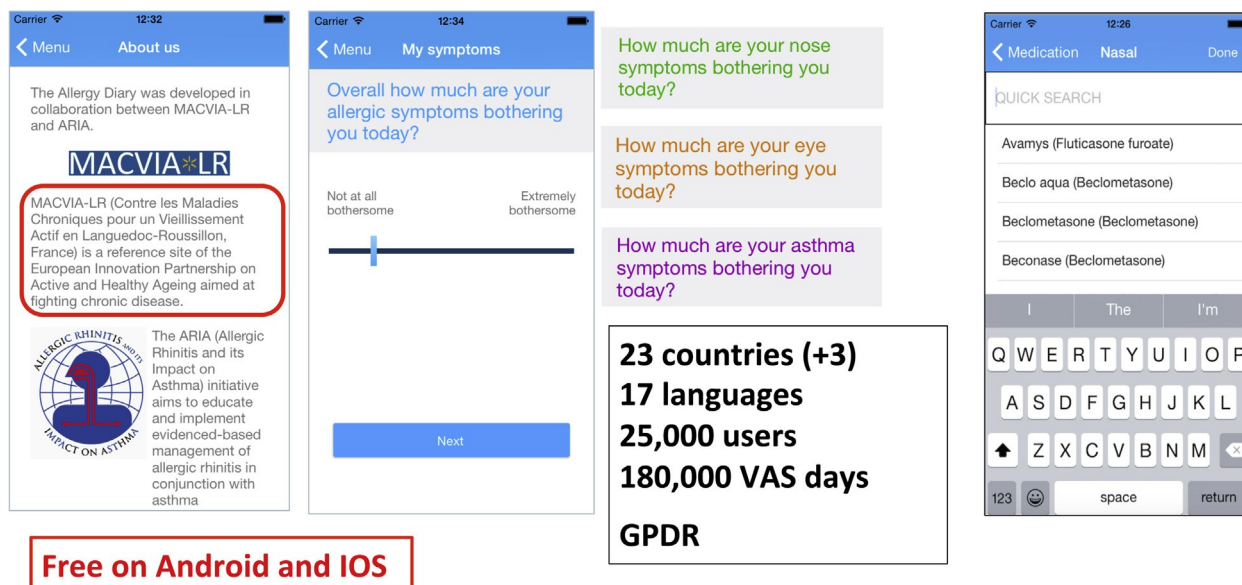


FIG 3. Allergy Diary. GDPR, General Data Protection Regulation (<https://www.eugdpr.org>).

are clear but insufficiently understood. Impact of Air Pollution on Asthma and Rhinitis (POLLAR) is a new Horizon 2020 project of the European Institute of Innovation and Technology for Health that will embed environmental data into the Allergy Diary. POLLAR aims at combining emerging technologies (including the Allergy Diary, which is Technology Readiness Level 9, meaning that the system is proved in an operational environment) with machine learning to (1) understand the effects of air pollution in patients with AR and its effects on sleep, work, and asthma; (2) assess societal consequences shared with citizens and professionals; (3) propose preventive strategies, including a sentinel network; and (4) develop participative policies.

ARIA PHASES 3 AND 4 DEPLOY A NOVEL KOTTER 8-STEP CHANGE MODEL

Goals

Although the first CM model developed by the ARIA initiative was a great success, there are still unmet needs in the treatment of asthma and rhinitis multimorbidity. In ARIA Phase 4 we encourage the participation of all the stakeholders.

The 8-step model

Establish a sense of urgency. ICPs will include multidisciplinary structured care plans detailing the keysteps of patient care, including self-care, as proposed by AIRWAYS ICPs.⁵⁴ GRADE-based guidelines for physicians are available for AR, and their recommendations are similar.^{3,5,15} However, they are based on the assumption that patients regularly use their treatment and are not tested with real-life data. Unfortunately, adherence to treatment is very low, and real-life studies do not

Create a guiding coalition. The ARIA Working Group initiated in 1999 includes more than 500 members in 70 countries.¹⁴ A successful coalition working on CM2 has been identified within the group.

The AIRWAYS ICPs coalition was established in 2014 and is part of the European Innovation Partnership on Active and Healthy Ageing (DG Sante and Directorate General for Communications Networks, Content & Technology).⁵⁴ Moreover, many national and European scientific societies (the European Academy of Allergy and Clinical Immunology, the European Respiratory Society, and the International Primary Care Respiratory Group), and other patients' organization (European Lung Foundation and Asthma UK) have joined the coalition. It is a World Health Organization Global Alliance against Chronic Respiratory Diseases demonstration project. Finally, the transfer of innovation of ARIA has been carried out to the reference sites of the European Innovation Partnership on Active and Healthy Ageing.⁶⁴

This CM2 guiding coalition is already in place in the European Forum for Research and Education in Allergy and Airways Diseases (<http://www.euforea.eu>).⁶⁷

Develop a vision and strategy. The vision of ARIA Phase 4 is to provide CM2 for AR and asthma multimorbidity to develop SDM with the ultimate goal of improving AR and asthma control while maintaining quality of life and reducing costs by using mobile technology and real-time data management to inform decisions.

The strategy for realizing the changes is based on the patient-centered implementation of ICPs⁵⁴ using IT solutions, such as the Allergy Diary.⁶

Communicate the change vision. The updated vision (CM2) will use the experience of the first CM strategy. It has already been discussed among the ARIA CM coalition members, and the present article is the first to be published. However, it takes

In a similar line of thinking, one could also consider a wider community-oriented approach to dissemination. This could also cover social media and self-help groups because some of the latter patients would benefit not only from both personal

BOUSQUET ET AL

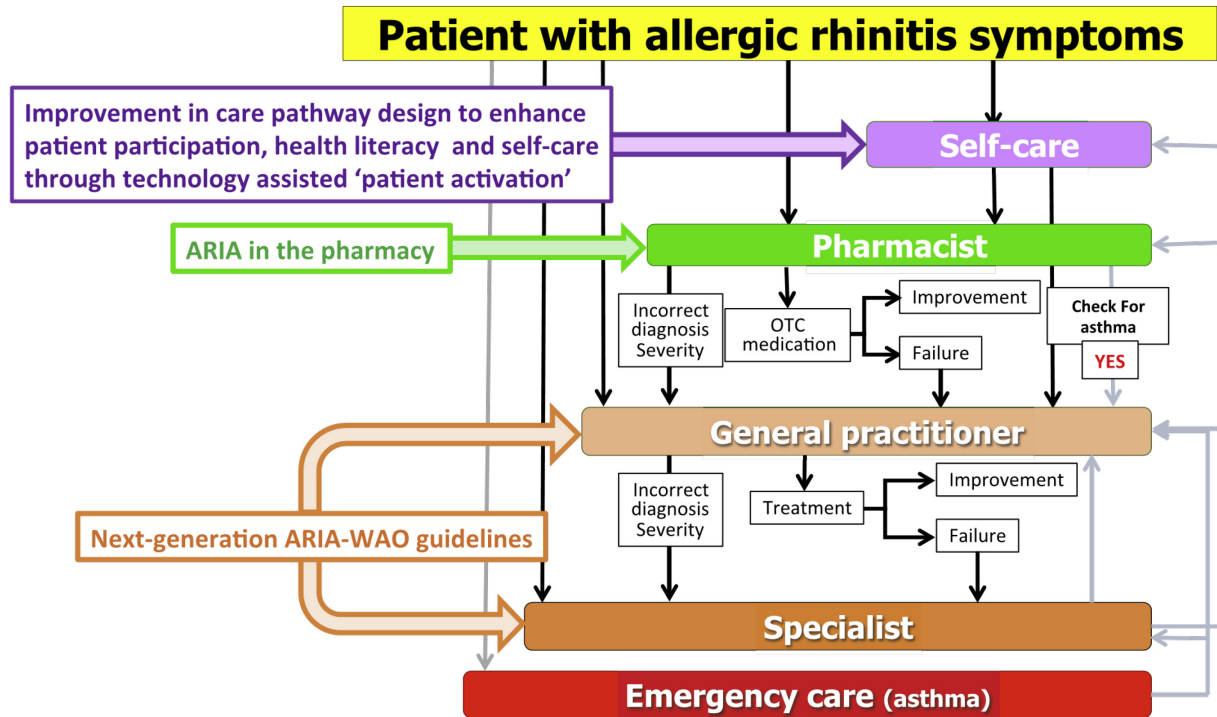


FIG 4. Change management based on next-generation ICPs.

time to address the concerns of all stakeholders, and articles published recently on the Allergy Diary might help to convince many. ARIA is involving a maximum number of people to deploy the CM vision.

The integration of new paths of understanding health and change is a requirement for the strategy. The CM2 model clearly expands and strengthens the potential for actual change to occur and take hold in all kinds of organizations and institutions. Supplementary to the ambition of change in existing practices and institutions, it is also important to consider the integration of other modes of communication and dissemination on the basis of healthy behavior. A central example is the general need to increase the level of health literacy in society. The general public should clearly not be perceived simply as patients waiting for something to happen. They should have the ability to navigate and understand health messages, an essential tool for self-managing well-being, even before any actual condition or major challenge actually occurs. However, to do so, one must consider how to improve this health literacy by integrating it much better into the educational system and cultural settings to which it applies. This is a very long-term investment in self-care and prevention. A later target audience with a higher level of health literacy will naturally also ensure an easier adoption of subsequent health messages, possibly using information and communication technology.⁶⁸ The basis for understanding is simply enhanced compared with the previous scenario.

previous experience and knowledge about these ailments but also from a supportive environment, which would be better able to support and help these citizens/friends/family members, regardless of age, in their attempt to adapt to new modes of behavior. This is a wider application of the CM2 model and should also be considered in our work to help patients and citizens.

Empower others to act on the vision. Organizational processes and structures are in place and are aligned with the overall organizational vision. However, we need to continuously check for barriers and for those who are resistant to change and focus on the education of both physicians and patients on how to achieve the best outcomes of treatment. We are acting proactively to remove the obstacles involved in the process of change.

Generate short-term wins. We propose to create new short-term (eg, 12 months) and medium-term (eg, 24 months) targets. In 2018, a high-level meeting organized by POLLAR will approach the improvement in care pathway design to enhance patient participation, health literacy, and self-care through technology-assisted "patient activation." In this meeting rhinitis and asthma multimorbidity will be used as a model of noncommunicable disease (Fig 4). Three major aspects of ICPs will be considered: self-care, pharmacy care, and next-generation guidelines in which the recommendations of the GRADE guidelines on AR^{5,15} will be tested in real life by using MASK.

Consolidate gains and produce more change. Most of the goals of the Kotter change model step 7¹² have been met by the ARIA CM and will be further developed in CM2.

CONCLUSIONS

For the past 18 years, ARIA has had the major goal of providing a guide for the diagnosis and management of AR and asthma multimorbidity applicable to developing countries^{1,2} by using the best evidence.³⁻⁵ ARIA Phases 1 and 2 were developed in accordance to the Kotter 8-step change model and can be used as a model of CM in patients with chronic diseases. However, there

are still unmet needs for the management of rhinitis and asthma in real life.

A second CM model has been proposed by ARIA Phases 3 and 4. It was initiated by the development in 23 countries of an app that showed partly unexpected results. Patients with AR (and possibly with asthma) do not follow physicians' advice: they selfmedicate. There is an urgent need to harness this information and to update our concept of treatment, as well as treatment adherence, by using mobile technology and care pathways. This is the goal of ARIA Phase 4 and the second wave of CM.

MASK Study Group

J. Bousquet,¹⁻³ P. W. Hellings,⁴ W. Aberer,⁵ I. Agache,⁶ C. A. Akdis,⁷ M. Akdis,⁷ M. R. Alberti,⁸ R. Almeida,⁹ F. Amat,¹⁰ R. Angles,¹¹ I. Annesi-Maesano,¹² I. J. Anotegui,¹³ J. M. Anto,¹⁴⁻¹⁷ S. Arnavielle,¹⁸ E. Asayag,¹⁹ A. Asarnoj,²⁰ H. Arshad,²¹ F. Avolio,²² E. Bacci,²³ C. Bachert,²⁴ I. Baiardini,²⁵ C. Barbara,²⁶ M. Barbagallo,²⁷ I. Baroni,²⁸ B. A. Barreto,²⁹ X. Basagana,¹⁴ E. D. Bateman,³⁰ M. Bedolla-Barajas,³¹ A. Bedbrook,² M. Bewick,³² B. Beghe,³³ E. H. Bel,³⁴ K. C. Bergmann,³⁵ K. S. Bennoor,³⁶ M. Benson,³⁷ L. Bertorello,²³ A. Z. Białoszewski,³⁸ T. Bieber,³⁹ S. Bialek,⁴⁰ C. Bindeslev-Jensen,⁴¹ L. Bjerner,⁴² H. Blain,^{43,44} F. Blasi,⁴⁵ A. Blua,⁴⁶ M. Bochenska Marciniak,⁴⁷ I. Bogus-Buczynska,⁴⁷ A. L. Boner,⁴⁸ M. Bonini,⁴⁹ S. Bonini,⁵⁰ C. S. Bosnic-Anticevich,⁵¹ I. Bosse,⁵² J. Bouchard,⁵³ L. P. Boulet,⁵⁴ R. Bourret,⁵⁵ P. J. Bousquet,¹² F. Braidio,²⁵ V. Briedis,⁵⁶ C. E. Brightling,⁵⁷ J. Brozek,⁵⁸ C. Bucca,⁵⁹ R. Buhl,⁶⁰ R. Buonaiuto,⁶¹ C. Panaiteanu,⁶² M. T. Burguete Cabañas,⁶³ E. Burté,³ A. Bush,⁶⁴ F. Caballero-Fonseca,⁶⁵ D. Cailliot,⁶⁷ D. Caimmi,⁶⁸ M. A. Calderon,⁶⁹ P. A. M. Camargos,⁷⁰ T. Camuzat,⁷¹ G. Canfora,⁷² G. W. Canonica,²⁵ V. Cardona,⁷³ K. H. Carlsen,⁷⁴ P. Carreiro-Martins,⁷⁵ A. M. Carriazo,⁷⁶ W. Carr,⁷⁷ C. Cartier,⁷⁸ T. Casale,⁷⁹ G. Castellano,⁸⁰ L. Cecchi,⁸¹ A. M. Cepeda Sarabia,⁸² N. H. Chavannes,⁸³ Y. Chen,⁸⁴ R. Chiron,⁶⁸ T. Chivato,⁸⁵ E. Chkhartishvili,⁸⁶ A. G. Chuchalin,⁸⁷ K. F. Chung,⁸⁸ M. M. Ciaravolo,⁸⁹ A. Ciceran,⁹⁰ C. Cingi,⁹¹ G. Ciprandi,⁹² A. C. Carvalho Coelho,⁹³ L. Colas,⁹⁴ E. Colgan,⁹⁵ J. Coll,⁹⁶ D. Conforti,⁹⁷ J. Correia de Sousa,⁹⁸ R. M. Cortes-Grimaldo,⁹⁹ F. Corti,¹⁰⁰ E. Costa,¹⁰¹ M. C. Costa-Dominguez,¹⁰² A. L. Courbis,¹⁰³ L. Cox,¹⁰⁴ M. Crescenzo,¹⁰⁵ A. Cruz,¹⁰⁶ A. Custovic,¹⁰⁷ W. Czarlewski,¹⁰⁸ S. E. Dahlen,¹⁰⁹ C. Dario,¹¹⁰ J. da Silva,¹¹¹ Y. Dauvilliers,¹¹² U. Darsow,¹¹³ F. De Blay,¹¹⁴ G. De Carlo,¹¹⁵ T. Dedeu,¹¹⁶ M. de Fatima Emerson,¹¹⁷ G. De Feo,¹¹⁸ G. De Vries,¹¹⁹ B. De Martino,¹²⁰ N. de Paula Motta Rubini,¹²¹ D. Deleanu,¹²² P. Demoly,^{12,68} J. A. Denburg,¹²³ P. Devillier,¹²⁴ S. Di Capua Ercolano,¹²⁵ N. Di Carluccio,⁶⁶ A. Didier,¹²⁶ D. Dokic,¹²⁷ M. G. Dominguez-Silva,¹²⁸ H. Douagui,¹²⁹ G. Dray,¹⁰³ R. Dubakienė,¹³⁰ S. R. Durham,¹³¹ G. Du Toit,¹³² M. S. Dykewicz,¹³³ Y. El-Gamal,¹³⁴ P. Eklund,¹³⁵ E. Eller,⁴¹ R. Emuzyte,¹³⁶ J. Farrell,⁹⁵ A. Farsi,⁸¹ J. Ferreira de Mello Jr,¹³⁷ J. Ferrero,¹³⁸ A. Fink-Wagner,¹³⁹ A. Fiocchi,¹⁴⁰ W. J. Fokkens,¹⁴¹ J. A. Fonseca,¹⁴² J. F. Fontaine,¹⁴³ S. Forti,⁹⁷ J. M. Fuentes-Perez,¹⁴⁴ J. L. Galvez-Romero,¹⁴⁵ A. Gamkrelidze,¹⁴⁶ J. Garcia-Aymerich,¹⁴ C. Y. Garcia-Cobas,¹⁴⁷ M. H. Garcia-Cruz,¹⁴⁸ B. Gemiciglu,¹⁴⁹ S. Genova,¹⁵⁰ G. Christoff,¹⁵¹ J. E. Gereda,¹⁵² R. Gerth van Wijk,¹⁵³ R. M. Gomez,¹⁵⁴ J. Gomez-Vera,¹⁵⁵ S. Gonzalez Diaz,¹⁵⁶ M. Gotua,¹⁵⁷ I. Grisle,¹⁵⁸ M. Guidacci,¹⁵⁹ N. A. Guldmond,¹⁶⁰ Z. Gutter,¹⁶¹ M. A. Guzman,¹⁶² T. Hahtela,¹⁶³ J. Hajjam,¹⁶⁴ L. Hernandez,¹⁶⁵ J. O'B. Hourihane,¹⁶⁶ Y. R. Huerta-Villalobos,¹⁶⁷ M. Humbert,¹⁶⁸ G. Iaccarino,¹⁶⁹ M. Illario,¹⁷⁰ J. C. Ivancevich,¹⁷¹ E. J. Jares,¹⁷² E. Jassem,¹⁷³ S. L. Johnston,¹⁷⁴ G. Joos,¹⁷⁵ K. S. Jung,¹⁷⁶ M. Jutel,¹⁷⁷ I. Kaidashev,¹⁷⁸ O. Kalayci,¹⁷⁹ A. F. Kalyoncu,¹⁸⁰ J. Karjalainen,¹⁸¹ P. Kardas,¹⁸² T. Keil,¹⁸³ P. K. Keith,¹⁸⁴ M. Khaitov,¹⁸⁵ N. Khaitov,¹⁸⁶ J. Kleine-Tebbe,¹⁸⁷ L. Klimek,¹⁸⁸ M. L. Kowalski,¹⁸⁹ M. Kuitunen,¹⁹⁰ I. Kull,¹⁹¹ P. Kuna,⁴⁷ M. Kupczyk,⁴⁷ V. Kvedariene,¹⁹² E. Krzych-Fa1ta,¹⁹³ P. Lacwik,⁴⁷ D. Larenas-

Linnemann,¹⁹⁴ D. Laune,¹⁸ D. Lauri,¹⁹⁵ J. Lavrut,¹⁹⁶ L. T. T. Le,¹⁹⁷ M. Lessa,¹⁹⁸ G. Levato,¹⁹⁹ J. Li,²⁰⁰ P. Lieberman,²⁰¹ A. Lipiec,¹⁹³ B. Lipworth,²⁰² K. C. Lodrup Carlsen,²⁰³ R. Louis,²⁰⁴ O. Lourenc, o,²⁰⁵ J. A. Luna-Pech,²⁰⁶ K. Maciej,⁴⁷ A. Magnan,⁹⁴ B. Mahboub,²⁰⁷ D. Maier,²⁰⁸ A. Mair,²⁰⁹ I. Majer,²¹⁰ J. Malva,²¹¹ E. Mandajieva,²¹² P. Manning,²¹³ E. De Manuel Keenoy,²¹⁴ G. D. Marshall,²¹⁵ M. R. Masjedi,²¹⁶ J. F. Maspero,²¹⁷ E. Mathieu-Dupas,¹⁸ J. J. Matta Campos,²¹⁸ A. L. Matos,²¹⁹ M. Maurer,²²⁰ S. Mavale-Manuel,²²¹ O. Mayora,⁹⁷ M. A. Medina-Avalos,²²² E. Melen,²²³ E. Melo-Gomes,²⁶ E. O. Meltzer,²²⁴ E. Menditto,²²⁵ J. Mercier,²²⁶ N. Miculinic,²²⁷ F. Mihaltan,²²⁸ B. Milenkovic,²²⁹ G. Moda,²³⁰ M. D. Mogica-Martinez,²³¹ Y. Mohammad,²³² I. Momas,^{233,234} S. Montefort,²³⁵ R. Monti,²³⁶ D. Mora Bogado,²³⁷ M. Morais-Almeida,²³⁸ F. F. Morato-Castro,²³⁹ R. M€osges,²⁴⁰ A. Mota-Pinto,²⁴¹ P. Moura Santo,²⁴² J. Mullol,²⁴³ L. M€unter,²⁴⁴ A. Muraro,²⁴⁵ R. Murray,²⁴⁶ R. Naclerio,²⁴⁷ R. Nadif,³ M. Nalin,²⁸ L. Napoli,²⁴⁸ L. Namazova-Baranova,²⁴⁹ H. Neffen,²⁵⁰ V. Niederberger,²⁵¹ K. Neckam,²⁵² A. Neou,²⁵³ A. Nieto,²⁵⁴ L. Nogueira-Silva,²⁵⁵ M. Nogues,^{2,256} E. Novellino,²⁵⁷ T. D. Nyembue,²⁵⁸ R. E. O'Hehir,²⁵⁹ C. Odzhakova,²⁶⁰ K. Ohta,²⁶¹ Y. Okamoto,²⁶² K. Okubo,²⁶³ G. L. Onorato,² M. Ortega Cisneros,²⁶⁴ S. Ouedraogo,²⁶⁵ I. Pali-Sch€oll,²⁶⁶ S. Palkonen,¹¹⁵ P. Panzner,²⁶⁷ N. G. Papadopoulos,²⁶⁸ H. S. Park,²⁶⁹ A. Papi,²⁷⁰ G. Passalacqua,²⁷¹ E. Paulino,²⁷² R. Pawankar,²⁷³ S. Pedersen,²⁷⁴ J. L. Pepin,²⁷⁵ A. M. Pereira,²⁷⁶ M. Persico,²⁷⁷ O. Pfaar,^{278,279} J. Phillips,²⁸⁰ R. Picard,²⁸¹ B. Pigearias,²⁸² I. Pin,²⁸³ C. Pitsios,²⁸⁴ D. Plavec,²⁸⁵ W. Pohl,²⁸⁶ T. A. Popov,²⁸⁷ F. Portejoie,² P. Potter,²⁸⁸ A. C. Pozzi,²⁸⁹ D. Price,²⁹⁰ E. P. Prokopakis,²⁹¹ R. Puy,²⁵⁹ B. Pugin,²⁹² R. E. Pulido Ross,²⁹³ M. Przemecka,⁴⁷ K. F. Rabe,²⁹⁴ F. Raciborski,¹⁹³ R. Rajabian-Soderlund,²⁹⁵ S. Reitsma,¹⁴¹ I. Ribeirinho,²⁹⁶ J. Rimmer,²⁹⁷ D. Rivero-Yeverino,²⁹⁸ J. A. Rizzo,²⁹⁹ M. C. Rizzo,³⁰⁰ C. Robalo-Cordeiro,³⁰¹ F. Rodenas,³⁰² X. Rodo,¹⁴ M. Rodriguez Gonzalez,³⁰³ L. Rodriguez-Ma˜nas,³⁰⁴ C. Rolland,³⁰⁵ S. Rodrigues Valle,³⁰⁶ M. Roman Rodriguez,³⁰⁷ A. Romano,³⁰⁸ E. Rodriguez-Zagal,³⁰⁹ G. Rolla,³¹⁰ R. E. Roller-Wirnsberger,³¹¹ M. Romano,²⁸ J. Rosado-Pinto,³¹² N. Rosario,³¹³ M. Rottgen,³¹⁴ D. Ryan,³¹⁵ H. Sagara,³¹⁶ J. Salim€aki,³¹⁷ B. Samolinski,¹⁹³ M. Sanchez-Borges,³¹⁸ J. Sastre-Dominguez,³¹⁹ G. K. Scadding,³²⁰ H. J. Schunemann,⁵⁸ N. Scichilone,³²¹ P. Schmid-Grendelmeier,³²² F. S. Serpa,³²³ S. Shamai,²⁴⁰ A. Sheikh,³²⁴ M. Sierra,⁹⁶ F. E. R. Simons,³²⁵ V. Siroux,³²⁶ J. C. Sisul,³²⁷ I. Skrinko,³⁷⁸ D. Sole,³²⁸ D. Somekh,³²⁹ M. Sondermann,³³⁰ T. Sooronbaev,³³¹ M. Sova,³³² M. Sorensen,³³³ M. Sorlini,³³⁴ O. Spranger,¹³⁹ C. Stellato,¹¹⁸ R. Stelmach,³³⁵ R. Stukas,³³⁶ J. Sunyer,¹⁴⁻¹⁷ J. Stozek,¹⁹³ A. Sylling,¹⁹³ J. N. Tebyric, a,³³⁷ M. Thibaudon,³³⁸ T. To,³³⁹ A. Todo-Bom,⁴⁰ P. V. Tomazic,³⁴¹ S. Toppila-Salmi,¹⁶³ U. Trama,³⁴² M. Triggiani,¹¹⁸ C. Suppli Ulrik,³⁴³ M. Urrutia-Pereira,³⁴⁴ R. Valenta,³⁴⁵ A. Valero,³⁴⁶ A. Valiulis,³⁴⁷ E. Valovirta,³⁴⁸ M. van Eerd,¹¹⁹ E. van Ganse,³⁴⁹ M. van Hage,³⁵⁰ O. Vandenplas,³⁵¹ M. T. Ventura,³⁵² G. Vezzani,³⁵³ T. Vasankari,³⁵⁴ A. Vatrella,¹¹⁸ M. T. Verissimo,²¹¹ F. Viart,⁷⁸ M. Viegi,³⁵⁵ D. Vicheva,³⁵⁶ T. Vontetsianos,³⁵⁷ M. Wagenmann,³⁵⁸ S. Walker,³⁵⁹ D. Wallace,³⁶⁰ D. Y. Wang,³⁶¹ S. Wasserman,³⁶² T. Werfel,³⁶³ M. Westman,³⁶⁴ M. Wickman,¹⁹¹ D. M. Williams,³⁶⁵ S. Williams,³⁶⁶ N. Wilson,³⁷⁹ J. Wright,³⁶⁷ P. Wroczyński,⁴⁰ P. Yakovlev,³⁶⁸ B. P. Yawn,³⁶⁹ P. K. Yiallourous,³⁷⁰ A. Yorgancioglu,³⁷¹ O. M. Yusuf,³⁷² H. J. Zar,³⁷³ L. Zhang,³⁷⁴ N. Zhong,²⁰⁰ M. E. Zernotti,³⁷⁵ M. Zidam,³⁷⁶ T. Zuberbier,³⁵ C. Zubrinich,²⁵⁹ and A. Zurkühlen³⁷⁷

From ¹University Hospital, Montpellier, France; ²MACVIA-France, Fondation partenariale FMC VIA-LR, Montpellier, France; ³VIMA, INSERM U 1168, VIMA: Ageing and Chronic Diseases Epidemiological and Public Health Approaches, Villejuif, Universite Versailles St-Quentin-en-Yvelines, UMR-S 1168, Montigny-le-Bretonneux, France, and Euforea, Brussels, Belgium; ⁴Laboratory of Clinical Immunology, Department of Microbiology and Immunology, KU Leuven, Leuven, Belgium; ⁵Department of Dermatology, Medical University of Graz, Graz, Austria; ⁶Transylvania University Brasov, Brasov, Romania; ⁷Swiss Institute of Allergy and Asthma

Research (SIAF), University of Zurich, Davos, Switzerland; ⁸Project Manager, Chairman of the Council of Municipality of Salerno, Salerno, Italy; ⁹Center for Health Technology and Services Research- CINTESIS, Faculdade de Medicina, Universidade do Porto, and Medida, Lda Porto, Portugal; ¹⁰Allergology Department, Centre de l'Asthme et des Allergies H^opital d'Enfants Armand-Trousseau (APHP), Sorbonne Universite, UPMC Univ Paris 06, UMR_S 1136, Institut Pierre Louis d'Epidemiologie et de Sante Publique, Equipe EPAR, Paris, France; ¹¹Innovacion y nuevas tecnologias, Salud Sector sanitario de Barbastro, Barbastro, Spain; ¹²Epidemiology of Allergic and Respiratory Diseases, Department Institute Pierre Louis of Epidemiology and Public Health, INSERM and UPMC Sorbonne Universite, Medical School Saint Antoine, Paris, France; ¹³Department of Allergy and Immunology, Hospital Quiron Bizkaia, Erandio, Spain; ¹⁴ISGlobAL, Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; ¹⁵IMIM (Hospital del Mar Research Institute), Barcelona, Spain; ¹⁶CIBER Epidemiologia y Salud Publica (CIBERESP), Barcelona, Spain; ¹⁷Universitat Pompeu Fabra (UPF), Barcelona, Spain; ¹⁸Kyomed, Montpellier, France; ¹⁹Argentine Society of Allergy and Immunopathology, Buenos Aires, Argentina; ²⁰Clinical Immunology and Allergy Unit, Department of Medicine Solna, Karolinska Institutet, Stockholm, and Astrid Lindgren Children's Hospital, Department of Pediatric Pulmonology and Allergy, Karolinska University Hospital, Stockholm, Sweden; ²¹David Hide Asthma and Allergy Research Centre, Isle of Wight, United Kingdom; ²²Regione Puglia, Bari, Italy; ²³Regione Liguria, Genoa, Italy; ²⁴Upper Airways Research Laboratory, ENT Dept, Ghent University Hospital, Ghent, Belgium; ²⁵Department of Biomedical Sciences, Humanitas University, Milan, Italy; ²⁶PNDR, Portuguese National Programme for Respiratory Diseases, Faculdade de Medicina de Lisboa, Lisbon, Portugal;

²⁷ Geriatric Unit, Department of Internal Medicine (DIBIMIS), University of Palermo, Palermo, Italy; ²⁸Telbios SRL, Milan, Italy; ²⁹Universidade do Estado do Para, Belem, Brazil; ³⁰Department of Medicine, University of Cape Town, Cape Town, South Africa; ³¹Hospital Civil de Guadalajara Dr Juan I Menchaca, Guadalajara, Mexico; ³²iQ4U Consultants, London, United Kingdom; ³³Section of Respiratory Disease, Department of Oncology, Haematology and Respiratory Diseases, University of Modena and Reggio Emilia, Modena, Italy; ³⁴Department of Respiratory Medicine, Academic Medical Center (AMC), University of Amsterdam, Amsterdam, The Netherlands;

³⁵ Charite-Universitätsmedizin Berlin, Berlin Institute of Health, Comprehensive Allergy Center, Department of Dermatology and Allergy, Global Allergy and Asthma European Network (GA²LEN), Berlin, Germany; ³⁶Department of Respiratory Medicine, National Institute of Diseases of the Chest and Hospital, Dhaka, Bangladesh; ³⁷Centre for Individualized Medicine, Department of Pediatrics, Faculty of Medicine, Linköping, Sweden; ³⁸Department of Prevention of Environmental Hazards and Allergology, Medical University of Warsaw, Warsaw, Poland; ³⁹BIEBER. Department of Dermatology and Allergy, Rheinische Friedrich-Wilhelms-University Bonn, Bonn, Germany;

⁴⁰ Department of Biochemistry and Clinical Chemistry, Faculty of Pharmacy with the Division of Laboratory Medicine Division, Warsaw Medical University, Warsaw, Poland; ⁴¹Department of Dermatology and Allergy Centre, Odense University Hospital, Odense Research Center for Anaphylaxis (ORCA), Odense, Denmark; ⁴²Department of Respiratory Medicine and Allergology, University Hospital, Lund, Sweden; ⁴³Department of Geriatrics, Montpellier University Hospital, Montpellier, France; ⁴⁴EA 2991, Euromov, University Montpellier, Montpellier, France; ⁴⁵Department of Pathophysiology and Transplantation, University of Milan, IRCCS Fondazione Ca'Granda Ospedale Maggiore Policlinico, Milan, Italy;

⁴⁶Argentine Association of Respiratory Medicine, Buenos Aires, Argentina; ⁴⁷Division of Internal Medicine, Asthma and Allergy, Barlicki University Hospital, Medical University of Lodz, Lodz, Poland; ⁴⁸Pediatric Department, University of Verona Hospital, Verona, Italy; ⁴⁹Department of Public Health and Infectious Diseases, Sapienza University of Rome, Rome, Italy; ⁵⁰Second University of Naples and Institute of Translational Medicine, Italian National Research Council, Naples, Italy; ⁵¹Woolcock Institute of Medical Research, University of Sydney and Sydney Local Health District, Glebe, Australia; ⁵²Allergist, La Rochelle, France; ⁵³Clinical Medicine, Laval University, Quebec City, H^opital de la Malbaie, La Malbaie, Quebec, Canada; ⁵⁴Quebec Heart and Lung Institute, Laval University, Quebec City, Quebec, Canada; ⁵⁵Centre Hospitalier Valencien, Valencien, France; ⁵⁶Department of Clinical Pharmacy of Lithuanian University of Health Sciences, Kaunas, Lithuania; ⁵⁷Institute of Lung Health, Respiratory Biomedical Unit, University Hospitals of Leicester NHS Trust, Leicestershire, and the Department of Infection, Immunity and Inflammation, University of Leicester, Leicester, United Kingdom; ⁵⁸Department of Health Research Methods, Evidence, and Impact, Division of Immunology and Allergy, Department of Medicine, McMaster University, Hamilton, Ontario, Canada; ⁵⁹Pneumology Unit-AOU Molinette, Hospital City of Health and Science of Torino, Torino, Italy; ⁶⁰Universitätsmedizin der Johannes Gutenberg-Universität Mainz, Mainz, Germany; ⁶¹Municipality Pharmacy, Sarno, Italy; ⁶²University of Medicine and Pharmacy Victor Babes, Timisoara, Romania; ⁶³Instituto de Pediatria, Hospital Zambrano Hellion Tec de Monterrey, Monterrey, Mexico; ⁶⁴Imperial College and Royal Brompton Hospital, London, United Kingdom; ⁶⁵Centro Medico Docente La Trinidad, Caracas, Venezuela; ⁶⁶Assofarm Campania and Cofaser, Salerno, Italy; ⁶⁷Service de Pneumologie, CHU et universite d'Auvergne, Clermont-Ferrand, France; ⁶⁸Department of Respiratory Diseases, Montpellier University Hospital, Montpellier, France; ⁶⁹Imperial College London, National Heart and Lung Institute, Royal Brompton Hospital NHS, London, United Kingdom; ⁷⁰Federal University of Minas Gerais, Medical School, Department of Pediatrics, Belo Horizonte, Brazil; ⁷¹Assitant Director General, Montpellier, Region Occitanie, France; ⁷²Anesthesiology Service, Sarno "Martiri del Villa Malta" Hospital, Sarno, Italy; ⁷³Allergy Section, Department of Internal Medicine, Hospital Vall d'Hebron, and ARADYAL Spanish Research Network, Barcelona, Spain; ⁷⁴Department of Paediatrics, Oslo University Hospital and University of Oslo, Oslo, Norway; ⁷⁵CEDOC, Integrated Pathophysiological Mechanisms Research Group, Nova Medical School, Campo dos Martires da Patria, Lisbon, and Servico de Imunoalergologia, Centro Hospitalar de Lisboa Central, EPE, Lisbon, Portugal; ⁷⁶Regional Ministry of Health of Andalusia, Seville, Spain; ⁷⁷Allergy and Asthma Associates of Southern California, Mission Viejo, Calif; ⁷⁸ASA-Advanced Solutions Accelerator, Clapiers, France; ⁷⁹Division of Allergy/Immunology, University of South Florida, Tampa, Fla; ⁸⁰Celentano pharmacy, Massa Lubrense, Italy;

⁸¹ SOS Allergology and Clinical Immunology, USL Toscana Centro, Prato, Italy; ⁸²Allergy and Immunology Laboratory, Metropolitan University, Simon Bolivar University, and SLaa, Sociedad Latinoamericana de Alergia, Asma e Immunologia, Barranquilla, Colombia; ⁸³Department of Public Health and Primary Care, Leiden University Medical Center, Leiden, The Netherlands;

⁸⁴ Capital Institute of Pediatrics, Chaoyang district, Beijing, China; School of Medicine, University CEU San Pablo, Madrid, Spain; ⁸⁶David Tvildiani Medical University-AIETI Highest Medical School, David Tatishvili Medical Center Tbilisi, Tbilisi, Georgia; ⁸⁷Pulmonary Research Institute FMBA and GARD Executive Committee, Moscow, Russia; ⁸⁸National Heart and Lung Institute, Imperial College, London, United Kingdom; ⁸⁹Specialist Social Worker, Sorrento, Italy; ⁹⁰Argentine Federation of Otorhinolaryngology

Societies, Buenos Aires, Argentina; ⁹¹Eskisehir Osmangazi University, Medical Faculty, ENT Department, Eskisehir, Turkey; ⁹²Medicine Department, IRCCS-Azienda Ospedaliera Universitaria San Martino, Genoa, Italy; ⁹³Universidade Federal da Bahia, Escola de Enfermagem, Brazil; ⁹⁴Plateforme Transversale d'Allergologie, Institut du Thorax, CHU de Nantes, Nantes, France; ⁹⁵LANUA International Healthcare Consultancy, Warrenpoint, Northern Ireland, United Kingdom; ⁹⁶Innovacion y nuevas tecnologías, Salud Sector sanitario de Barbastro, Barbastro, Spain; ⁹⁷Innovation and Research Office, Department of Health and Social Solidarity, Autonomous Province of Trento, Trento, Italy; ⁹⁸Life and Health Sciences Research Institute (ICVS), School of Medicine, University of Minho, Braga, and ICVS/3B's, PT Government Associate Laboratory, Braga/Guimarães, Portugal; ⁹⁹Servicio de Allergología, Hospital Angeles del Carmen, Guadalajara, Mexico; ¹⁰⁰FIMMG (Federazione Italiana Medici di Medicina Generale), Milan, Italy; ¹⁰¹UCIBIO, REQUINTE, Faculty of Pharmacy and Competence Center on Active and Healthy Ageing of University of Porto (Porto 4 Ageing), Porto, Portugal; ¹⁰²Allergologo, Mexico City, Mexico; ¹⁰³IMT Mines Ales, Université Montpellier, Ales, France; ¹⁰⁴Department of Medicine, Nova Southeastern University, Davie, University of Miami Department of Medicine, Miami, Fla; ¹⁰⁵Assofarm Campania and Cofaser, Salerno, Italy; ¹⁰⁶ProAR-Núcleo de Excelencia em Asma, Federal University of Bahia, Salvador and the WHO GARD Planning Group; ¹⁰⁷Centre for Respiratory Medicine and Allergy, Institute of Inflammation and Repair, University of Manchester and University Hospital of South Manchester, Manchester, United Kingdom; ¹⁰⁸Medical Consulting Czarlewski, Levallois, France; ¹⁰⁹Centre for Allergy Research, The Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; ¹¹⁰Azienda Provinciale per i Servizi Sanitari di Trento (APSS-Trento), Trento, Italy;

¹¹¹ Department of Internal Medicine and Allergy Clinic of Pr Plydoro Ernani de Sao Thiago University Hospital, Federal University of Santa Catarina (UFSC), Florianópolis, Brazil; ¹¹²Sleep Unit, Department of Neurology, Hôpital Gui-de-Chauliac Montpellier, INSERM U1061, Montpellier, France;

¹¹³ Department of Dermatology and Allergy, Technische Universität München, and ZAUM-Center for Allergy and Environment, Helmholtz Center Munich, Technische Universität München, Munich, Germany; ¹¹⁴Allergy Division, Chest Disease Department, University Hospital of Strasbourg, Strasbourg, France; ¹¹⁵European Federation of Allergy and Airways Diseases Patients' Associations, Brussels, Belgium; ¹¹⁶AQuAS, Barcelona, Spain, and EUREGHA, European Regional and Local Health Association, Brussels, Belgium; ¹¹⁷Policlinica Geral do Rio de Janeiro, Rio de Janeiro, Brazil;

¹¹⁸ Department of Medicine, Surgery and Dentistry "Scuola Medica Salernitana," University of Salerno, Salerno, Italy; ¹¹⁹Peercode BV, Geldermalsen, The Netherlands; ¹²⁰Social Workers Coordinator, Sorrento, Italy; ¹²¹Federal University of the State of Rio de Janeiro, School of Medicine and Surgery, Rio de Janeiro, Brazil; ¹²²Allergology and Immunology Discipline, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania;

¹²³ Department of Medicine, Division of Clinical Immunology and Allergy, McMaster University, Hamilton, Ontario, Canada; ¹²⁴Laboratoire de Pharmacologie Respiratoire UPRES EA220, Hôpital Foch, Suresnes, Université Versailles Saint-Quentin, Université Paris Saclay, Paris, France; ¹²⁵Farmacie Dei Golfi Group, Massa Lubrense, Italy; ¹²⁶Rangueil-Larrey Hospital, Respiratory Diseases Department, Toulouse, France; ¹²⁷University Clinic of Pulmology and Allergy, Medical Faculty Skopje R Macedonia, Skopje, Macedonia;

Allergologo, Mexico City, Mexico; Service de Pneumo-Allergologie, Centre Hospitalo-Universitaire de Beni-Messous, Algiers, Algeria; ¹³⁰Clinic of Infectious, Chest Diseases, Dermatology And allergology, Vilnius University, Vilnius, Lithuania; ¹³¹Allergy and Clinical Immunology National Heart and Lung Institute, Imperial College London, London, United Kingdom;

¹³² Guy's and St Thomas' NHS Trust, Kings College London, London, United Kingdom; ¹³³Section of Allergy and Immunology, Saint Louis University School of Medicine, St Louis, Mo; ¹³⁴Pediatric Allergy and Immunology Unit, Children's Hospital, Ain Shams University, Cairo, Egypt; ¹³⁵Department of Computing Science, Umea University, Umea, Sweden, and Four Computing Oy, Salo, Finland; ¹³⁶Clinic of Children's Diseases, Faculty of Medicine, Vilnius University, Vilnius, Lithuania; ¹³⁷University of São Paulo Medical School, São Paulo, Brazil; ¹³⁸Andalusian Agency for Healthcare Quality, Seville, Spain; ¹³⁹Global Allergy and Asthma Platform GAAPP, Vienna, Austria; ¹⁴⁰Division of Allergy, Department of Pediatric Medicine, Bambino Gesù Children's Research Hospital Holy See, Rome, Italy;

¹⁴¹ Department of Otorhinolaryngology, Academic Medical Centre, Amsterdam, the Netherlands; ¹⁴²CINTESIS, Center for Research in Health Technologies and Information Systems, Faculdade da Medicina da Universidade do Porto and MEDIDA, Porto, Portugal; ¹⁴³Allergist, Reims, France; ¹⁴⁴Hospital General Regional 1 "Dr Carlos Mc Gregor Sanchez Navarro" IMSS, Mexico City, Mexico; ¹⁴⁵Regional hospital of ISSSTE, Puebla, Mexico; ¹⁴⁶National Center for Disease Control and Public Health of Georgia, Tbilisi, Georgia;

¹⁴⁷ Allergologo, Guadalajara, Mexico; Allergy Clinic, National Institute of Respiratory Diseases, Mexico City, Mexico; ¹⁴⁹Department of Pulmonary Diseases, Istanbul University, Cerrahpasa Faculty of Medicine, Istanbul, Turkey; ¹⁵⁰Allergology unit, UHATEM "NIPirogov," Sofia, Bulgaria;

¹⁵¹ Medical University, Faculty of Public Health, Sofia, Bulgaria; Allergy and Immunology Division, Clinica Ricardo Palma, Lima, Peru; ¹⁵³Department of Internal Medicine, section of Allergology, Erasmus MC, Rotterdam, The Netherlands; ¹⁵⁴Allergy & Asthma Unit, Hospital San Bernardo, Salta, Argentina; ¹⁵⁵Allergy Clinic, Hospital Regional del ISSSTE "Lic. Lopez Mateos," Mexico City, Mexico; ¹⁵⁶Centro Regional de Excelencia CONACYT WAO en Alergia, Asma e Inmunología, Hospital Universitario, Universidad Autónoma de Nuevo León, Monterrey, Mexico; ¹⁵⁷Center of Allergy and Immunology, Georgian Association of Allergology and Clinical Immunology, Tbilisi, Georgia; ¹⁵⁸Latvian Association of Allergists, Center of Tuberculosis and Lung Diseases, Riga, Latvia; ¹⁵⁹Federal District Base Hospital Institute, Brasília, Brazil; ¹⁶⁰Institute of Health Policy and Management iBMG, Erasmus University, Rotterdam, The Netherlands; ¹⁶¹University Hospital Olomouc-National eHealth Centre, Olomouc, Czech Republic; ¹⁶²Immunology and Allergy Division, Clinical Hospital, University of Chile, Santiago, Chile; ¹⁶³Skin and Allergy Hospital, Helsinki University Hospital, University of Helsinki, Helsinki, Finland; ¹⁶⁴Centich: centre d'expertise national des technologies de l'information et de la communication pour l'autonomie, Gerontopôle autonomie longévité des Pays de la Loire, Conseil régional des Pays de la Loire, Centre d'expertise Partenariat Européen d'Innovation pour un vieillissement actif et en bonne santé, Nantes, France; ¹⁶⁵Autonomous University of Baja California, Ensenada, Baja California, Mexico; ¹⁶⁶Department of Paediatrics and Child Health, University College Cork, Cork, Ireland;

¹⁶⁷ Hospital General Regional 1 "Dr. Carlos MacGregor Sanchez Navarro" IMSS, Mexico City, Mexico; ¹⁶⁸Université Paris-Sud; Service de Pneumologie, Hôpital Bicêtre; Inserm UMR_S999, Le Kremlin Bicêtre,

France; ¹⁶⁹Dipartimento di medicina, chirurgia e odontoiatria, universita di Salerno, Salerno, Italy; ¹⁷⁰Division for Health Innovation, Campania Region and Federico II University Hospital Naples (R&D and DISMET) Naples, Italy; ¹⁷¹Servicio de Alergia e Immunologia, Clinica Santa Isabel, Buenos Aires, Argentina; ¹⁷²Libra Foundation, Buenos Aires, Argentina; ¹⁷³Medical University of Gdansk, Department of Allergology, Gdansk, Poland; ¹⁷⁴Airway Disease Infection Section, National Heart and Lung Institute, Imperial College, and MRC & Asthma UK Centre in Allergic Mechanisms of Asthma, London, United Kingdom; ¹⁷⁵Department of Respiratory Medicine, Ghent University Hospital, Ghent, Belgium; ¹⁷⁶Hallym University College of Medicine, Hallym University Sacred Heart Hospital, Gyeonggi-do, South Korea; ¹⁷⁷Department of Clinical Immunology, Wrocław Medical University, Wrocław, Poland;

¹⁷⁸Ukrainina Medical Stomatological Academy, Poltava, Ukraine; Pediatric Allergy and Asthma Unit, Hacettepe University School of Medicine, Ankara, Turkey; ¹⁸⁰Hacettepe University, School of Medicine, Department of Chest Diseases, Immunology and Allergy Division, Ankara, Turkey; ¹⁸¹Allergy Centre, Tampere University Hospital, Tampere, Finland; ¹⁸²First Department of Family Medicine, Medical University of Lodz, Lodz, Poland;

¹⁸³Institute of Social Medicine, Epidemiology and Health Economics, Charité-Universitätsmedizin Berlin, Berlin, and Institute for Clinical Epidemiology and Biometry, University of Würzburg; ¹⁸⁴Department of Medicine, McMaster University, Health Sciences Centre 3V47 West, Hamilton, Ontario, Canada; ¹⁸⁵National Research Center, Institute of Immunology, Federal Medical Biological Agency, Laboratory of Molecular Immunology, Moscow, Russian Federation; ¹⁸⁶GARD, Geneva, Switzerland; ¹⁸⁷Allergy & Asthma Center Westend, Berlin, Germany; ¹⁸⁸Center for Rhinology and Allergology, Wiesbaden, Germany; ¹⁸⁹Department of Immunology, Rheumatology and Allergy, Medical University of Lodz, and HARC, Lodz, Poland; ¹⁹⁰Children's Hospital and University of Helsinki, Helsinki, Finland; ¹⁹¹Department of Clinical Science and Education, Södersjukhuset, Karolinska Institutet, Stockholm and Sachs' Children and Youth Hospital, Södersjukhuset, Stockholm, Sweden; ¹⁹²Faculty of Medicine, Vilnius University, Vilnius, Lithuania;

¹⁹³Department of Prevention of Environmental Hazards and Allergology, Medical University of Warsaw, Warsaw, Poland; ¹⁹⁴Center of Excellence in Asthma and Allergy, Medica Sur Clinical Foundation and Hospital, Mexico City, Mexico; ¹⁹⁵CMMC, Milan, Italy; ¹⁹⁶Allergy Department of Pedro de Elizalde Children's Hospital, Buenos Aires, Argentina; ¹⁹⁷University of Medicine and Pharmacy, Hochiminh City, Vietnam; ¹⁹⁸Federal University of Bahia, Salvador, Brazil; ¹⁹⁹Sifmed, Milan, Italy; ²⁰⁰State Key Laboratory of Respiratory Diseases, Guangzhou Institute of Respiratory Disease, the First Affiliated Hospital of Guangzhou Medical University, Guangzhou, China;

²⁰¹Departments of Internal Medicine and Pediatrics (Divisions of Allergy and Immunology), University of Tennessee College of Medicine, Germantown, Tenn; ²⁰²Scottish Centre for Respiratory Research, Cardiovascular & Diabetes Medicine, Medical Research Institute, Ninewells Hospital, University of Dundee, Dundee, United Kingdom; ²⁰³Oslo University Hospital, Department of Paediatrics, Oslo, and University of Oslo, Faculty of Medicine, Institute of Clinical Medicine, Oslo, Norway; ²⁰⁴Department of Pulmonary Medicine, CHU Sart-Tilman, and GIGA I3 Research Group, Liege, Belgium;

²⁰⁵Faculty of Health Sciences and CICS-UBI, Health Sciences Research Centre, University of Beira Interior, Covilhã, Portugal; ²⁰⁶Department of Philosophical, Methodological and Instrumental Disciplines, CUCS, University of Guadalajara, Guadalajara, Mexico; ²⁰⁷Department of Pulmonary Medicine, Rashid Hospital, Dubai, United Arab Emirates;

²⁰⁸Biomax Informatics AG, Munich, Germany; ²⁰⁹Directorate of Finance, eHealth & Pharmaceuticals, Scottish Government Health Department, Edinburgh, United Kingdom;

²¹⁰Department of Respiratory Medicine, University of Bratislava, Bratislava, Slovakia; ²¹¹Coimbra Institute for Clinical and Biomedical Research (iCBBR), Faculty of Medicine, University of Coimbra, and Ageing@Coimbra EIPAHA Reference Site, Coimbra, Portugal; ²¹²Medical Center Iskar, Sofia, Bulgaria; ²¹³Department of Medicine (RCSI), Bon Secours Hospital, Glasnevin, Dublin, Ireland; ²¹⁴Kronikgune, International Centre of Excellence in Chronicity Research Barakaldo, Bizkaia, Spain; ²¹⁵Division of Clinical Immunology and Allergy, Laboratory of Behavioral Immunology Research, University of Mississippi Medical Center, Jackson, Miss; ²¹⁶Tobacco Control Research Centre, Iranian Anti-Tobacco Association, Tehran, Iran; ²¹⁷Argentine Association of Allergy and Clinical Immunology, Buenos Aires, Argentina; ²¹⁸Hospital de Especialidades, Centro Medico Nacional Siglo XXI, Mexico City, Mexico; ²¹⁹University of Southeast Bahia, Vitoria da Conquista, Brazil; ²²⁰Allergie-Centrum-Charité at the Department of Dermatology and Allergy, Charité-Universitätsmedizin Berlin, Berlin, Germany;

²²¹Maputo Central Hospital—Department of Paediatrics, Maputo, Mozambique; ²²²Allergologo, Veracruz, Mexico; ²²³Sachs' Children and Youth Hospital, Södersjukhuset, and Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; ²²⁴Allergy and Asthma Medical Group and Research Center, San Diego, Calif; ²²⁵CIRFF, Federico II University, Naples, Italy; ²²⁶Department of Physiology, CHRU, University Montpellier, PhyMedExp, INSERM U1046, Montpellier, France; ²²⁷Croatian Pulmonary Society, Zagreb, Croatia; ²²⁸National Institute of Pneumology M Nasta, Bucharest, Romania; ²²⁹Clinic for Pulmonary Diseases, Clinical Center of Serbia, Faculty of Medicine, University of Belgrade, Serbian Association for Asthma and COPD, Belgrade, Serbia; ²³⁰Regione Piemonte, Torino, Italy;

²³¹Col Jardines de Sta Monica, Tlalneptla, Mexico; ²³²National Center for Research in Chronic Respiratory Diseases, Tishreen University School of Medicine, Latakia, Syria; ²³³Department of Public health and health products, Paris Descartes University-Sorbonne Paris Cité, EA 4064, and the Paris Municipal Department of Social Action, Childhood, and Health, Paris, France;

²³⁴Paris Municipal Department of Social Action, Childhood, and Health, Paris, France; ²³⁵Mater Dei Hospital Malta, Department of Medicine, University of Malta, Faculty of Medicine and Surgery, University of Medicine, La Valette, Malta; ²³⁶Department of Medical Sciences, Allergy and Clinical Immunology Unit, University of Torino & Mauriziano Hospital, Torino, Italy;

²³⁷Instituto de Prevision Social IPS HC, Socia de la SPAAL, Tesorera de la SLAAI, Asuncion, Paraguay; ²³⁸Allergy Center, CUF Descobertas Hospital, Lisbon, Portugal; ²³⁹Universidade de São Paulo, São Paulo, Brazil; ²⁴⁰Institute of Medical Statistics, and Computational Biology, Medical Faculty, University of Cologne, Germany, and CRI—Clinical Research International, Hamburg, Germany; ²⁴¹General Pathology Institute, Faculty of Medicine, University of Coimbra, and Ageing@Coimbra EIP-AHA Reference Site, Coimbra, Portugal; ²⁴²Federal University of Bahia, Salvador, Brazil; ²⁴³Rhinology Unit & Smell Clinic, ENT Department, Hospital Clinic, and Clinical and Experimental Respiratory Immunology, IDIBAPS, CIBERES, University of Barcelona, Barcelona, Spain; ²⁴⁴Danish Committee for Health Education, Copenhagen, Denmark; ²⁴⁵Food Allergy Referral Centre Veneto Region, Department of Women and Child Health, Padua General University Hospital, Padua, Italy; ²⁴⁶MedScript, Dundalk, Ireland; ²⁴⁷Johns Hopkins School of Medicine, Baltimore, Md; ²⁴⁸COFASER—Pharmacy Services Consortium, Salerno, Italy; ²⁴⁹Scientific Centre of Children's Health under

the MoH, Russian National Research Medical University named Pirogov, Moscow, Russia; ²⁵⁰Center of Allergy, Immunology and Respiratory Diseases, Santa Fe, Argentina Center for Allergy and Immunology, Santa Fe, Argentina;

²⁵¹Department of Otorhinolaryngology, Medical University of Vienna, AKH, Vienna, Austria; ²⁵²Hospital of the Hospitaller Brothers in Buda, Budapest, Hungary; ²⁵³Die Hautambulanz und Rothhaar Study Center, Berlin, Germany; ²⁵⁴Neumologia y Alergologia Infantil, Hospital La Fe, Valencia, Spain;

²⁵⁵Center for Health Technology and Services Research-CINTESIS and Department of Internal Medicine, Centro Hospitalar Sao Joao, Porto, Portugal; ²⁵⁶Caisse d'assurance retraite et de la sante au travail du Languedoc-Roussillon (CARSAT-LR), Montpellier, France; ²⁵⁷Department of Pharmacy, University of Naples Federico II, Naples, Italy; ²⁵⁸ENT Department, University Hospital of Kinshasa, Kinshasa, Congo; ²⁵⁹Department of Allergy, Immunology and Respiratory Medicine, Alfred Hospital and Central Clinical School, and the Department of Immunology, Monash University, Melbourne; ²⁶⁰Medical Center, Varna, Bulgaria; ²⁶¹National Hospital Organization, Tokyo National Hospital, Tokyo, Japan; ²⁶²Department of Otorhinolaryngology, Chiba University Hospital, Chiba, Japan; ²⁶³Department of Otolaryngology, Nippon Medical School, Tokyo, Japan; ²⁶⁴Allergologo, Jalisco, Guadalajara, Mexico; ²⁶⁵Centre Hospitalier Universitaire Pediatrique Charles de Gaulle, Ouagadougou, Burkina Faso; ²⁶⁶Department of Comparative Medicine, Messerli Research Institute of the University of Veterinary Medicine and Medical University, Vienna, Austria; ²⁶⁷Department of Immunology and Allergology, Faculty of Medicine and Faculty Hospital in Pilsen, Charles University in Prague, Pilsen, Czech Republic; ²⁶⁸Center for Pediatrics and Child Health, Institute of Human Development, Royal Manchester Children's Hospital, University of Manchester, Manchester, United Kingdom, and the Allergy Department, 2nd Pediatric Clinic, Athens General Children's Hospital "P&A Kyriakou," University of Athens, Athens, Greece; ²⁶⁹Department of Allergy and Clinical Immunology, Ajou University School of Medicine, Suwon, South Korea; ²⁷⁰Respiratory Medicine, Department of Medical Sciences, University of Ferrara, Ferrara, Italy; ²⁷¹Allergy and Respiratory Diseases, Ospedale Policlinico San Martino, University of Genoa, Genoa, Italy; ²⁷²Farmacias Holon, Lisbon, Portugal; ²⁷³Department of Pediatrics, Nippon Medical School, Tokyo, Japan; ²⁷⁴University of Southern Denmark, Kolding, Denmark; ²⁷⁵Universite Grenoble Alpes, Laboratoire HP2, INSERM U1042, and CHU de Grenoble, Grenoble, France. ²⁷⁶Allergy Unit, CUF- Porto Hospital and Institute, and Center for Research in Health Technologies and information systems CINTESIS, Universidade do Porto, Porto, Portugal;

²⁷⁷Sociologist, Municipality Area n33, Sorrento, Italy; Center for Rhinology and Allergology, Wiesbaden, Germany; ²⁷⁹Department of Otorhinolaryngology, Head and Neck Surgery, Universitätsmedizin Mannheim, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; ²⁸⁰Centre for Empowering People and Communities, Dublin, Ireland; ²⁸¹Conseil General de l'Economie Ministere de l'Economie, de l'Industrie et du Numerique, Paris, France; ²⁸²Societe de Pneumologie de Langue Française, Espace francophone de Pneumologie, Paris, France; ²⁸³Departement de pediatrie, CHU de Grenoble, Grenoble, France; ²⁸⁴Medical School, University of Cyprus, Nicosia, Cyprus; ²⁸⁵Children's Hospital Srebrnjak, Zagreb, School of Medicine, University J.J. Strossmayer, Osijek, Croatia; ²⁸⁶Karl Landsteiner Institute for Clinical and Experimental Pneumology, Hietzing Hospital, Vienna, Austria; ²⁸⁷University Hospital "Sv. Ivan Rilski," Sofia, Bulgaria;

²⁸⁸Allergy Diagnostic and Clinical Research Unit, University of Cape Town Lung Institute, Cape Town, South Africa; ²⁸⁹IML, Milan, Italy; ²⁹⁰Centre of

Academic Primary Care, Division of Applied Health Sciences, University of Aberdeen, Aberdeen, United Kingdom, and Observational and Pragmatic Research Institute, Singapore.

²⁹¹Department of Otorhinolaryngology University of Crete School of Medicine, Heraklion, Greece; ²⁹²European Forum for Research and Education in Allergy and Airway Diseases (EUFOREA), Brussels, Belgium; ²⁹³Allergologo, Cancun, Quintana Roo, Mexico; ²⁹⁴LungenClinic Grosshansdorf, Airway Research Center North, Member of the German Center for Lung Research (DZL), Grosshansdorf, Germany Department of Medicine, Christian Albrechts University, Airway Research Center North, Member of the German Center for Lung Research (DZL), Kiel, Germany; ²⁹⁵Department of Nephrology and Endocrinology, Karolinska University Hospital, Stockholm, Sweden; ²⁹⁶Farmacia S~ao Paio, Vila Nova de Gaia, Porto, Portugal; ²⁹⁷St Vincent's Hospital and University of Sydney, Sydney, Australia; ²⁹⁸Allergologo, Mexico City, Mexico; ²⁹⁹Serviço de Pneumologia-Hosp das Clinicas UFPE-EBSERH, Recife, Brazil; ³⁰⁰Universidade Federal de S~ao Paulo, S~ao Paulo, Brazil; ³⁰¹Centre of Pneumology, Coimbra University Hospital, Coimbra, Portugal; ³⁰²Polibienestar Research Institute, University of Valencia, Valencia, Spain; ³⁰³Pediatric Allergy and Clinical Immunology, Hospital Angeles Pedregal, Mexico City, Mexico;

³⁰⁴Getafe University Hospital Department of Geriatrics, Madrid, Spain;

³⁰⁵Association Asthme et Allergie, Paris, France; Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; ³⁰⁷Primary Care Respiratory Research Unit Instituto Investigacion Sanitaria de Palma IdisPa, Palma de Mallorca, Spain; ³⁰⁸Allergy Unit, Presidio Columbus, Rome, Catholic University of Sacred Heart, Rome and IRCCS Oasi Maria SS, Troina, Italy; ³⁰⁹Hospital General, Mexico City, Mexico; ³¹⁰Regione Piemonte, Torino, Italy;

³¹¹Medical University of Graz, Department of Internal Medicine, Graz, Austria; ³¹²Serviço de Imunoalergologia Hospital da Luz Lisboa Portugal, Lisbon, Portugal; ³¹³Hospital de Clinicas, University of Parana, Parana, Brazil; ³¹⁴Division of Allergy Asthma and Clinical Immunology, Emek Medical Center, Afula, Israel; ³¹⁵Honorary Clinical Research Fellow, Allergy and Respiratory Research Group, University of Edinburgh, Edinburgh, United Kingdom (Past President SLAAI, FACAIA, UK); ³¹⁶Showa University School of Medicine, Tokyo, Japan; ³¹⁷Association of Finnish Pharmacies, Helsinki, Finland; ³¹⁸Allergy and Clinical Immunology Department, Centro Medico Docente la Trinidad and Clinica El Avila, Caracas, Venezuela; ³¹⁹Faculty of Medicine, Autonomous University of Madrid, Madrid, Spain; ³²⁰Royal National TNE Hospital, University College London, London, United Kingdom;

³²¹DIBIMIS, University of Palermo, Palermo, Italy; Allergy Unit, Department of Dermatology, University Hospital of Zurich, Zurich, Switzerland;

³²³Asthma Reference Center, Escola Superior de Ciencias da Santa Casa de Misericordia de Vitoria-Esperito, Santo, Brazil; ³²⁴Allergy and Respiratory Research Group, Centre for Population Health Sciences, University of Edinburgh Medical School, Edinburgh, United Kingdom; ³²⁵Department of Pediatrics & Child Health, Department of Immunology, Faculty of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada; ³²⁶INSERM, Universite Grenoble Alpes, IAB, U 1209, Team of Environmental Epidemiology Applied to Reproduction and Respiratory Health, Universite Joseph Fourier, Grenoble, France; ³²⁷Sociedad Paraguaya de Alergia Asma e Inmunologia, Paraguay; ³²⁸Division of Allergy, Clinical Immunology and

Rheumatology, Department of Pediatrics, Federal University of São Paulo, São Paulo, Brazil;

³²⁹ European Health Futures Forum (EHFF), Isle of Wight, United Kingdom;

³³⁰ ENT, Aachen, Germany; ³³¹ Kyrgyzstan National Centre of Cardiology and Internal medicine, Euro-Asian respiratory Society, Bishkek, Kyrgyzstan;

³³² University Hospital Olomouc, Olomouc, Czech Republic; Department of Paediatric and Adolescent medicine, University Hospital of North Norway, Tromsø, Paediatric Research Group, Department of Clinical Medicine, Faculty of Health Sciences, UiT The Arctic University of Norway, Tromsø, Norway; ³³⁴ IML (Lombardy Medical Initiative), Bergamo, Italy; ³³⁵ Pulmonary Division, Heart Institute (InCor), Hospital da Clinicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil; ³³⁶ Public Health Institute of Vilnius University, Vilnius, Lithuania; ³³⁷ Universidade Federal do Estado do Rio de Janeiro, Rio de Janeiro, Brazil; ³³⁸ RNSA (Reseau National de Surveillance Aerobiologique), Brussieu, France; ³³⁹ Hospital for Sick Children, Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada; ³⁴⁰ Imunoalergologia, Centro Hospitalar Universitario de Coimbra and Faculty of Medicine, University of Coimbra, Coimbra, Portugal;

³⁴¹ Department of ENT, Medical University of Graz, Graz, Austria; ³⁴² Campania Region, Division on Pharmacy and devices policy, Naples, Italy;

³⁴³ Department of Respiratory Medicine, Hvidovre Hospital & University of Copenhagen, Denmark; ³⁴⁴ Universidade Federal dos Pampas, Uruguai, Brazil; ³⁴⁵ Division of Immunopathology, Department of Pathophysiology and Allergy Research, Center for Pathophysiology, Infectiology and Immunology, Medical University of Vienna, Vienna, Austria; ³⁴⁶ Pneumology and Allergy Department CIBERES and Clinical & Experimental Respiratory Immunology, IDIBAPS, University of Barcelona, Barcelona, Spain; ³⁴⁷ Vilnius University Institute of Clinical Medicine, Clinic of Children's Diseases, and Institute of Health Sciences, Department of Public Health, Vilnius, Lithuania, and the European Academy of Paediatrics (EAP/UEMS-SP), Brussels, Belgium; ³⁴⁸ Department of Lung Diseases and Clinical Immunology Allergy, University of Turku and Terveystalo Allergy Clinic, Turku, Finland;

³⁴⁹ PELyon, HESPER 7425, Health Services and Performance Research—Universite Claude Bernard, Lyon, France; ³⁵⁰ Immunology and Allergy Unit, Department of Medicine Solna, Karolinska Institutet and University Hospital, Stockholm, Sweden; ³⁵¹ Department of Chest Medicine, Centre Hospitalier Universitaire UCL Namur, Universite Catholique de Louvain, Yvoir, Belgium; ³⁵² University of Bari Medical School, Unit of Geriatric Immunology, Arcispedale S. Maria Nuova/IRCCS, AUSL di Reggio Emilia, Italy; ³⁵⁴ FILHA, Finnish Lung Association, Helsinki, Finland; ³⁵⁵ Pulmonary Environmental Epidemiology Unit, CNR Institute of Clinical Physiology, Pisa, Italy, and CNR Institute of Biomedicine and Molecular Immunology “A. Monroy,” Palermo, Italy; ³⁵⁶ Medical University, Plovdiv, Bulgaria, Department of Otorhinolaryngology, Plovdiv, Bulgaria; ³⁵⁷ Sotiria Hospital, Athens, Greece;

³⁵⁸ Department of Otorhinolaryngology, Universitätsklinikum Düsseldorf, Germany; ³⁵⁹ Asthma UK, Mansell street, London, United Kingdom;

³⁶⁰ Nova Southeastern University, Fort Lauderdale, Fla; Department of Otolaryngology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore; ³⁶² Department of Medicine, Clinical Immunology and Allergy, McMaster University, Hamilton, Ontario, Canada; ³⁶³ Division of Immunodermatology and Allergy Research, Department of Dermatology and Allergy, Hannover Medical School, Hannover, Germany; ³⁶⁴ Department of

Medicine Solna, Immunology and Allergy Unit, Karolinska Institutet and Department of ENT diseases, Karolinska University Hospital, Stockholm, Sweden; ³⁶⁵ Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC; ³⁶⁶ International Primary Care Respiratory Group, Aberdeen, Scotland; ³⁶⁷ Bradford Institute for Health Research, Bradford Royal Infirmary, Bradford, United Kingdom; ³⁶⁸ Medical College of Medical Faculty, Thracian University, Stara Zagora, Bulgaria; ³⁶⁹ Department of Research, Olmsted Medical Center, Rochester, Minn; ³⁷⁰ Cyprus International Institute for Environmental & Public Health in Association with Harvard School of Public Health, Cyprus University of Technology, Limassol, Cyprus, and Department of Pediatrics, Hospital “Archbishop Makarios III”, Nicosia, Cyprus; ³⁷¹ Celal Bayar University Department of Pulmonology, Manisa, Turkey; ³⁷² Allergy and Asthma Institute, Islamabad, Pakistan; ³⁷³ Department of Paediatrics and Child Health, Red Cross Children's Hospital, and MRC Unit on Child & Adolescent Health, University of Cape Town, Cape Town, South Africa; ³⁷⁴ Department of Otolaryngology Head and Neck Surgery, Beijing TongRen Hospital and Beijing Institute of Otolaryngology, Beijing, China; ³⁷⁵ Universidad Catolica de Cordoba, Cordoba, Argentina; ³⁷⁶ University Clinic of Respiratory and Allergic Diseases, Golnik, Slovenia; ³⁷⁷ Gesundheitsregion Köln Bonn—HRCB Projekt GmbH, Cologne, Germany;

³⁷⁸ Akershus University Hospital, Department of Otorhinolaryngology, Akershus, Norway; ³⁷⁹ Northern Health Science Alliance and Northern Health Matters Ltd, Manchester, United Kingdom.

REFERENCES

1. Shekelle PG, Woolf SH, Eccles M, Grimshaw J. Clinical guidelines: developing guidelines. *BMJ* 1999;318:593-6.
2. Bousquet J, Van Cauwenberge P, Khaltaev N. Allergic rhinitis and its impact on asthma. *J Allergy Clin Immunol* 2001;108(suppl):S147-334.
3. Brozek JL, Bousquet J, Baena-Cagnani CE, Bonini S, Canonica GW, Casale TB, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines: 2010 revision. *J Allergy Clin Immunol* 2010;126:466-76.
4. Padjas A, Kehar R, Aleem S, Mejza F, Bousquet J, Schunemann HJ, et al. Methodological rigor and reporting of clinical practice guidelines in patients with allergic rhinitis: QuGAR study. *J Allergy Clin Immunol* 2014;133:777-83.e4.
5. Brozek JL, Bousquet J, Agache I, Agarwal A, Bachert C, Bosnic-Anticevich S, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) Guidelines—2016 Revision. *J Allergy Clin Immunol* 2017;140:950-8.
6. Bousquet J, Hellings PW, Agache I, Bedbrook A, Bachert C, Bergmann KC, et al. ARIA 2016: Care pathways implementing emerging technologies for predictive medicine in rhinitis and asthma across the life cycle. *Clin Transl Allergy* 2016;6:47.
7. Bousquet J, Anto JM, Wickman M, Keil T, Valenta R, Haahela T, et al. Are allergic multimorbidities and IgE polysensitization associated with the persistence or re-occurrence of foetal type 2 signalling? The MeDALL hypothesis. *Allergy* 2015;70:1062-78.
8. Anto JM, Bousquet J, Akdis M, Auffray C, Keil T, Momas I, et al. Mechanisms of the Development of Allergy (MeDALL): introducing novel concepts in allergy phenotypes. *J Allergy Clin Immunol* 2017;139:388-99.
9. Carr WW, Yawn BP. Management of allergic rhinitis in the era of effective over-the-counter treatments. *Postgrad Med* 2017;129:572-80.
10. Lombardi C, Musicco E, Rastrelli F, Bettoncelli G, Passalacqua G, Canonica GW. The patient with rhinitis in the pharmacy. A cross-sectional study in real life. *Asthma Res Pract* 2015;1:4.
11. Fromer LM, Blaiss MS, Jacob-Nara JA, Long RM, Mannion KM, Lauersen LA. Current Allergic Rhinitis Experiences Survey (CARES): consumers' awareness, attitudes and practices. *Allergy Asthma Proc* 2014;35:307-15.
12. Kotter J. Leading change. Boston: Harvard Business School Press; 1996.
13. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA²LEN and AllerGen). *Allergy* 2008;63(suppl 86):8-160.
14. Bousquet J, Schunemann HJ, Samolinski B, Demoly P, Baena-Cagnani CE, Bachert C, et al. Allergic Rhinitis and its Impact on Asthma (ARIA): achievements in 10 years and future needs. *J Allergy Clin Immunol* 2012;130:1049-62.

15. Dykewicz MS, Wallace DV, Baroody F, Bernstein J, Craig T, Finegold I, et al. Treatment of seasonal allergic rhinitis: an evidence-based focused 2017 guideline update. *Ann Allergy Asthma Immunol* 2017;119:489-511.e41.
16. Bousquet J, Bewick M, Arnavielhe S, Mathieu-Dupas E, Murray R, Bedbrook A, et al. Work productivity in rhinitis using cell phones: the MASK pilot study. *Allergy* 2017;72:1475-84.
17. Bousquet J, Caimmi DP, Bedbrook A, Bewick M, Hellings PW, Devillier P, et al. Pilot study of mobile phone technology in allergic rhinitis in European countries: the MASK-rhinitis study. *Allergy* 2017;72:857-65.
18. Bousquet J, Onorato GL, Bachert C, Barbolini M, Bedbrook A, Bjerner L, et al. CHRODIS criteria applied to the MASK (MACVIA-ARIA Sentinel Network) Good Practice in allergic rhinitis: a SUNFRIL report. *Clin Transl Allergy* 2017;7:37.
19. Caimmi D, Baiz N, Tanno LK, Demoly P, Arnavielhe S, Murray R, et al. Validation of the MASK-rhinitis visual analogue scale on smartphone screens to assess allergic rhinitis control. *Clin Exp Allergy* 2017;47:1526-33.
20. Bousquet J, Arnavielhe S, Bedbrook A, Alexis-Alexandre G, Eerd Mv, Murray R, et al. Treatment of allergic rhinitis using mobile technology with real world data: The MASK observational pilot study. *Allergy* 2018;73:1763-74.
21. Bousquet J, Arnavielhe S, Bedbrook A, Fonseca J, Morais Almeida M, Todo Bom A, et al. The Allergic Rhinitis and its Impact on Asthma (ARIA) score of allergic rhinitis using mobile technology correlates with quality of life: the MASK study. *Allergy* 2018;73:505-10.
22. Bousquet J, Devillier P, Anto JM, Bewick M, Haahtela T, Arnavielhe S, et al. Daily allergic multimorbidity in rhinitis using mobile technology: a novel concept of the MASK study. *Allergy* 2018;73:1622-31.
23. Bousquet J, VandenPlas O, Bewick M, Arnavielhe S, Bedbrook A, Murray R, et al. The Work Productivity and Activity Impairment Allergic Specific (WPAIAS) questionnaire using mobile technology: the MASK study. *J Investig Allergol Clin Immunol* 2018;28:42-4.
24. Barry MJ, Edgman-Levitan S. Shared decision making—pinnacle of patient-centered care. *N Engl J Med* 2012;366:780-1.
25. Florin J, Ehrenberg A, Ehnfors M. Clinical decision-making: predictors of patient participation in nursing care. *J Clin Nurs* 2008;17:2935-44.
26. Guadagnoli E, Ward P. Patient participation in decision-making. *Soc Sci Med* 1998;47:329-39.
27. Agency for Health Care resources (AHRQ). The CAHPS ambulatory care improvement guide. Practical strategies for improving patient experience. Strategy 61: shared decision making. Available at: <https://www.ahrq.gov/cahps/quality-improvement/improvement-guide/6-strategies-for-improving/communication/strategy61-shared-decisionmaking.html>. Accessed October 15, 2018.
28. Kew KM, Malik P, Aniruddhan K, Normansell R. Shared decision-making for people with asthma. *Cochrane Database Syst Rev* 2017;10:CD012330.
29. Barrow JM, Toney-Butler TJ. Change, management. Treasure Island (FL): StatPearls; 2017.
30. Lewin K. Psychological ecology. In: Cartwright D, editor. *Field theory in social science*. London: Social Science Paperbacks; 1943.
31. Antwi M, Kale M. Change management in healthcare: literature review. Monieson Centre for Business Research in Healthcare, Queen's University, Ottawa, Ontario: Canadian Electronic Library. Available at: <http://www.worldcat.org/title/change-management-in-healthcare-literature-review/oclc/905858789>.
32. Lippitt R, Watson J, Westley B. The dynamics of planned change. New York: Harcourt, Brace and World; 1958.
33. Lewin K. Defining the field at a given time. *Psychol Rev* 1943;50:292.
34. Stoller JK. Implementing change in respiratory care. *Respir Care* 2010;55: 749-57.
35. Reddeman L, Foxcroft S, Gutierrez E, Hart M, Lockhart E, Mendelsohn M, et al. Improving the quality of radiation treatment for patients in Ontario: increasing peer review activities on a jurisdictional level using a change management approach. *J Oncol Pract* 2016;12(81-2):e61-70.
36. Burden M. Using a change model to reduce the risk of surgical site infection. *Br J Nurs* 2016;25:949-55.
37. Henry LS, Christine Hansson M, Houghton VC, Waite AL, Bowers M, Siegrist V, et al. Application of Kotter's theory of change to achieve baby-friendly designation. *Nurs Womens Health* 2017;21:372-82.
38. Teixeira B, Gregory PAM, Austin Z. How are pharmacists in Ontario adapting to practice change? Results of a qualitative analysis using Kotter's change management model. *Can Pharm J (Ott)* 2017;150:198-205.
39. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, Fitzgerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J* 2008;31:143-78.
40. Reddel HK, Bateman ED, Becker A, Boulet LP, Cruz AA, Drazen JM, et al. A summary of the new GINA strategy: a roadmap to asthma control. *Eur Respir J* 2015;46:622-39.
41. Rodriguez-Roisin R, Rabe KF, Vestbo J, Vogelmeier C, Agusti A. all previous and current members of the Science Committee and the Board of Directors of GOLD (goldcopd.org/committees/). Global Initiative for Chronic Obstructive Lung Disease (GOLD) 20th Anniversary: a brief history of time. *Eur Respir J* 2017;50.
42. Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease 2017 report. GOLD Executive Summary. *Am J Respir Crit Care Med* 2017;195:557-82.
43. Fokkens WJ, Lund VJ, Mullol J, Bachert C, Alobid I, Baroody F, et al. EPOS 2012: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. *Rhinology* 2012;50:1-12.
44. Leynaert B, Bousquet J, Neukirch C, Liard R, Neukirch F. Perennial rhinitis: an independent risk factor for asthma in nonatopic subjects: results from the European Community Respiratory Health Survey. *J Allergy Clin Immunol* 1999; 104:301-4.
45. Chanet P, Vignola AM, Vic P, Guddo F, Bonsignore G, Godard P, et al. Comparison between nasal and bronchial inflammation in asthmatic and control subjects. *Am J Respir Crit Care Med* 1999;159:588-95.
46. Simons FE. Allergic rhinobronchitis: the asthma-allergic rhinitis link. *J Allergy Clin Immunol* 1999;104:534-40.
47. Togias A. Rhinitis and asthma: evidence for respiratory system integration. *J Allergy Clin Immunol* 2003;111:1171-84.
48. Wallace DV, Dykewicz MS. Seasonal Allergic Rhinitis: A focused systematic review and practice parameter update. *Curr Opin Allergy Clin Immunol* 2017;17: 286-94.
49. Brozek JL, Akl EA, Alonso-Coello P, Lang D, Jaeschke R, Williams JW, et al. Grading quality of evidence and strength of recommendations in clinical practice guidelines. Part 1 of 3. An overview of the GRADE approach and grading quality of evidence about interventions. *Allergy* 2009;64:669-77.
50. Okubo K, Kuroono Y, Ichimura K, Enomoto T, Okamoto Y, Kawauchi H, et al. Japanese guidelines for allergic rhinitis 2017. *Allergol Int* 2017;66:205-19.
51. Navarro AM, Delgado J, Munoz-Cano RM, Dordal MT, Valero A, Quirce S, et al. Allergic respiratory disease (ARD), setting forth the basics: proposals of an expert consensus report. *Clin Transl Allergy* 2017;7:16.
52. Aguilar D, Pinart M, Koppelman GH, Saes Y, Nawijn MC, Postma DS, et al. Computational analysis of multimorbidity between asthma, eczema and rhinitis. *PLoS One* 2017;12:e0179125.
53. Bousquet J, Michel J, Standberg T, Crooks G, Iakovidis I, Gomez M. The European Innovation Partnership on Active and Healthy Ageing: the European Geriatric Medicine introduces the EIP on AHA Column. *Eur Geriatr Med* 2014;5: 361-2.
54. Bousquet J, Addis A, Adcock I, Agache I, Agusti A, Alonso A, et al. Integrated care pathways for airway diseases (AIRWAYS-ICPs). *Eur Respir J* 2014;44: 304-23.
55. Bousquet J, Barbara C, Bateman E, Bel E, Bewick M, Chavannes NH, et al. AIRWAYS-ICPs (European Innovation Partnership on Active and Healthy Ageing) from concept to implementation. *Eur Respir J* 2016;47:1028-33.
56. Bousquet J, Anto JM, Berkouk K, Gergen P, Antunes JP, Auge P, et al. Developmental determinants in non-communicable chronic diseases and ageing. *Thorax* 2015;70:595-7.
57. Bousquet J, Farrell J, Crooks G, Hellings P, Bel EH, Bewick M, et al. Scaling up strategies of the chronic respiratory disease programme of the European Innovation Partnership on Active and Healthy Ageing (Action Plan B3: Area 5). *Clin Transl Allergy* 2016;6:29.
58. Bousquet J, Bewick M, Cano A, Eklund P, Fico G, Goswami N, et al. Building bridges for innovation in ageing: synergies between action groups of the EIP on AHA. *J Nutr Health Aging* 2017;21:92-104.
59. Bousquet J, Dahl R, Khaltayev N. Global alliance against chronic respiratory diseases. *Allergy* 2007;62:216-23.
60. Bousquet J, Schunemann HJ, Fonseca J, Samolinski B, Bachert C, Canonica GW, et al. MACVIA-ARIA Sentinel Network for allergic rhinitis (MASK-rhinitis): the new generation guideline implementation. *Allergy* 2015;70:1372-92.
61. Onder G, Palmer K, Navickas R, Jureviciene E, Mammarella F, Strandzheva M, et al. Time to face the challenge of multimorbidity. A European perspective from the joint action on chronic diseases and promoting healthy ageing across the life cycle (JA-CHRODIS). *Eur J Intern Med* 2015;26:157-9.
62. Klimek L, Bergmann KC, Biedermann T, Bousquet J, Hellings P, Jung K, et al. Visual analogue scales (VAS): measuring instruments for the documentation of symptoms and therapy monitoring in cases of allergic rhinitis in everyday health care: position paper of the German Society of Allergology (AcDA) and the German Society of Allergy and Clinical Immunology (DGAKI), ENT Section, in

collaboration with the working group on Clinical Immunology, Allergology and Environmental Medicine of the German Society of Otorhinolaryngology, Head and Neck Surgery (DGHNOKHC). *Allergo J Int* 2017;26:16-24.

63. Burte E, Bousquet J, Siroux V, Just J, Jacquemin B, Nadif R. The sensitization pattern differs according to rhinitis and asthma multimorbidity in adults: the EGEA study. *Clin Exp Allergy* 2017;47:520-9.
64. Bousquet J, Agache I, Aliberti MR, Angles R, Annesi-Maesano I, Anto JM, et al. Transfer of innovation on allergic rhinitis and asthma multimorbidity in the elderly (MACVIA-ARIA)—EIP on AHA Twinning Reference Site (GARD research demonstration project). *Allergy* 2018;73:77-92.

65. Bourret R, Bousquet J, Mercier J, Camuzat T, Bedbrook A, Demoly P, et al. MASK rhinitis, a single tool for integrated care pathways in allergic rhinitis. *World Hosp Health Serv* 2015;51:36-9.
66. Bousquet J, Schunemann HJ, Hellings PW, Arnavielhe S, Bachert C, Bedbrook A, et al. MACVIA clinical decision algorithm in adolescents and adults with allergic rhinitis. *J Allergy Clin Immunol* 2016;138:367-74.e2.
67. Hellings PW, Akdis CA, Bachert C, Bousquet J, Pugin B, Adriaensen G, et al. EUFOREA Rhinology Research Forum 2016: report of the brainstorming sessions on needs and priorities in rhinitis and rhinosinusitis. *Rhinology* 2017;55:202-10.
68. Mahmud AI, Olander E, Eriksen S, Haglund BJ. Health communication in primary health care—a case study of ICT development for health promotion. *BMC Med Inform Decis Mak* 2013;13:17.